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FOUNDED 1872

Vol. CXXX. No. 3368. JUNE 12, 1942 6d. WEEKLY

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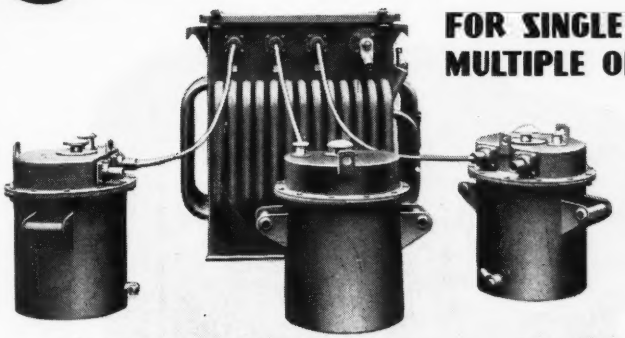

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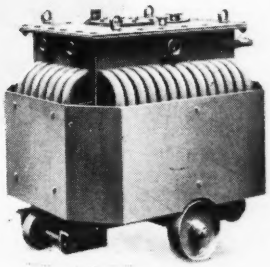

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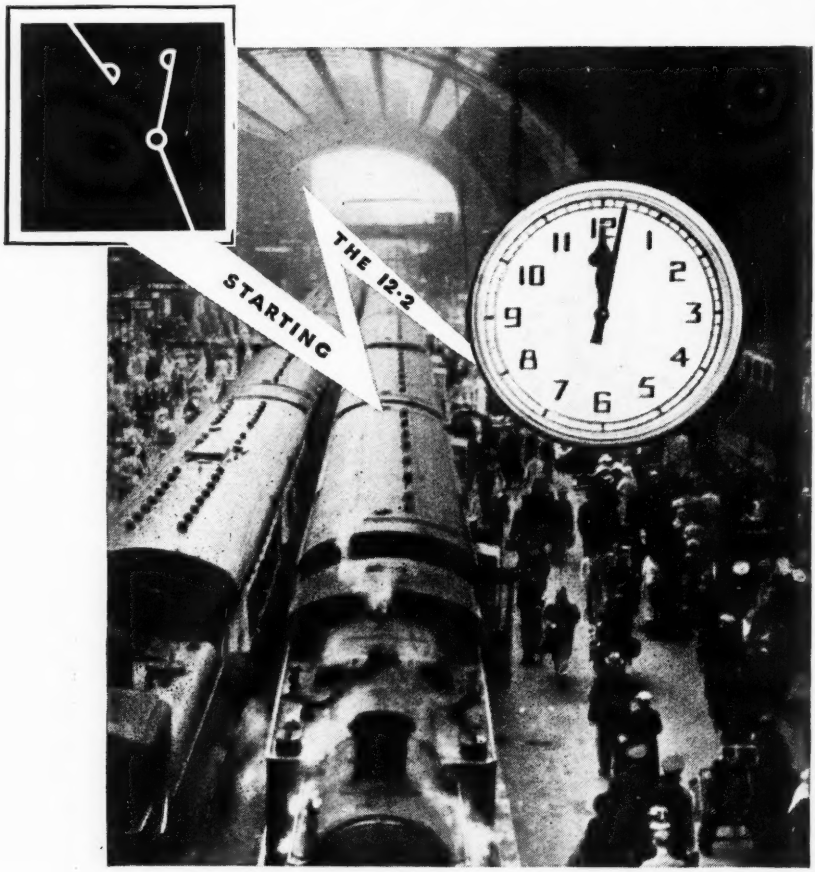

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ELECTRICAL REVIEW

Volume CXXX — No. 3368

Friday, June 12, 1942

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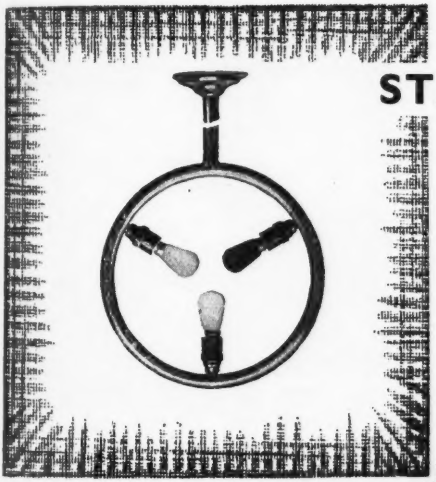

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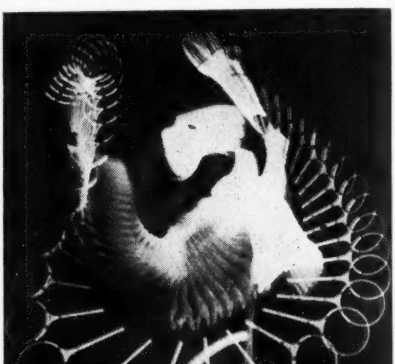

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ELECTRICAL REVIEW
THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXX. No. 3368. JUNE. 12, 1942 6d. WEEKLY

The Ministry of Fuel

Reorganisation and Economy

A BELATED realisation by the Government that something more than a diversion of a proportion of the fuel used for domestic purposes to war industries is needed to get over the present coal shortage is indicated by the setting up of the Ministry of Fuel, Light and Power under Major Gwilym Lloyd George. The White Paper on Coal (particulars of which are given in this issue) prescribes the machinery for the exercise of powers that are already largely conferred by the Defence Regulations.

Guidance for Consumers

With this evidence of intention on the part of the authorities to go to the root of the trouble, householders will be far more eager to accept the very necessary, and probably very real, sacrifices called for as their contribution towards overcoming a serious obstacle to the war effort. Consumers of electricity will be in a mood to respond more enthusiastically to the economy propaganda of E.D.A. and the supply undertakings, which should be maintained as insistently as is the paper salvage publicity.

The result of aptly-framed appeals to the public to keep within the bounds of the compulsory rationing scheme (at present in abeyance) should be to make the enforcement of the latter unnecessary. This is certainly to be hoped for, not on account of objections to rationing in present circumstances, but because the carrying out of the scheme would involve difficulties that would, we believe, more than offset any advantages it might possess.

A good feature of the White Paper proposals is the recognition they give to the point that increase in output depends largely on improvement in details in individual collieries, so that over-centralised control would be particularly vicious here. Much of the executive responsibility for raising production will be delegated to regional bodies on which will be included colliery technicians. It is to be hoped, since greater mechanisation is one of the aims, that an appropriate number of certified electricians will be among them.

From the director concerned with public services in each region, a proper appreciation is to be expected of the overall economy to be obtained from the use of suitable qualities of cleaned coal at generating stations. In this he would be well-advised to consult combustion engineers and designers of boiler furnaces and mechanical stokers.

Effect on Electricity Supply

The organisation now to be established, although primarily intended to tide over a war crisis, will remain in being until the future of the mining industry has been settled by Parliament. This brings up the question of the effect of the impact of new legislation on the position of electricity supply. Ostensibly it does not appear illogical that coal and the refined forms in which it is sold to the public, electricity and gas, should be answerable to Parliament through the same Minister.

With regard to administration, presumably the Electricity Commissioners will retain the statutory duty of promoting the supply of electricity. The Central Electricity Board will still be responsible for giving bulk supplies on terms enabling it to meet the standing charges on the grid. The ability of the Board to do so has a certain relationship with a continuance of the growth of load, especially the domestic, when present restrictions can be removed. So also has the ability of the supply undertakings to fulfil their obligations to the public with regard to both availability and price of electricity. No doubt the various implications of the position will be carefully watched by those concerned for electrical development in the national interest.

Engineering In U.S.S.R.

THE inclusion of a lecture on "Engineering in the Soviet Union" as one of a series of seven arranged by the Anglo-Soviet Public Relations Association is an appropriate recognition of the essential part played by electrification in the planned economy of that country. Dr. A. P. M. Fleming may be relied upon to do full justice next Wednesday at the Royal Institution to the boldness of conception that has characterised technical developments there, of which the Dniepestroi hydro-electric scheme has provided a signal example, and in addition, by its sacrifice, has provided a symbol of the will of the Russian peoples to resist aggression.

Electrical Aid for Gas

EVEN advocates of closer co-operation between gas and electricity suppliers must have been surprised to read that it was proposed to contribute £4,800 from the Halifax Electricity Department's profits to the gas undertaking. This was the consequence of a decision to allocate £10,000 from the electricity surplus in aid of the rates, and of the Finance Committee returning £4,800 of the gas undertaking. Thus, in effect, the Light, Heat and Power Committee (which is responsible for both undertakings) had to contribute a net sum of £5,200 to the rates. There were a number of opponents of the proposal and it was pointed out that Alderman Gledhill, who introduced the "budget," had earlier attacked the policy of taking money from trading undertakings. Alderman Waddington, who had contested the policy for many years, agreed to it now "as a matter of expediency." There is, however, a double question of principle involved which seriously affects the future of the electricity supply industry, namely: Should electricity consumers pay more to the rates than other people, and should they subsidise the gas supply?

War Uses of Electricity

ONE measure of the vital contribution made by electricity towards winning the war is the increase of 62 per cent. in the kWh taken by industry last year compared with 1938. Calls upon generating plant and coal stocks were mitigated by a falling off in consumption for non-essential power supplies (partly due to industrial concentration), street lighting (by 89 per cent.), traction (by 4 per cent.) and commercial purposes (by 20 per cent.), while domestic consumption is estimated to have increased by only 12 per cent. as against 65 per cent. during the three immediately pre-war years. The net result is an overall advance over 1938 of 34 per cent., indicating that about 32 thousand million kWh was generated in 1941 by public supply undertakings.

Help From The Liffey

IT is unfortunate that circumstances have made it imperative for the Electricity Supply Board of Eire to nullify the good work it has done in developing the use of electricity in its difficult area by imposing drastic restrictions on consumption. Had the Liffey plant been ready early this year as was hoped the shortage would have been less acute. However, our Dublin Correspondent reports that, barring further unforeseen obstacles, the new supply should be available early in the winter. A pointer to the progress made was the holding of a sale of surplus construction equipment on May 27th. The Liffey Scheme has been in course of realisation for four and a half years. It was calculated to cost about a million pounds and 400 men have been employed on concreting alone.

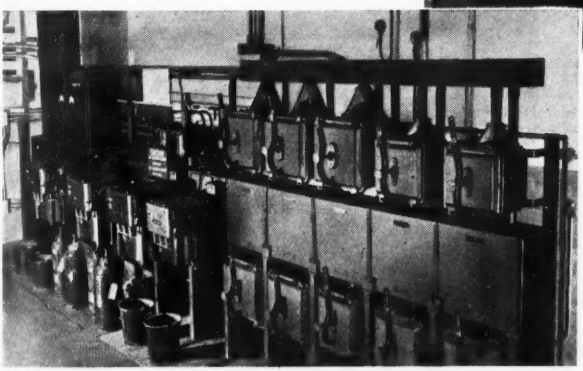
Have you appointed a Paper Salvage Officer?

Aircraft Maintenance

A New Aspect of Electrical Versatility

DURING the decade or so before the war opportunities for stressing afresh the versatility of electricity in industry were opened up so frequently that the term became almost a platitude. Having now become fairly accustomed to the new conception of production brought about by the war, a recent visit to a large aircraft maintenance establishment seems to have given us a new meaning for the term " versatility of electricity usage," for whereas the order of the day in normal war-factory production is uniformity for " all-out " working, in the case under review the lay-out provides for any conditions at any time to meet emergency repairs and urgent specialised production.

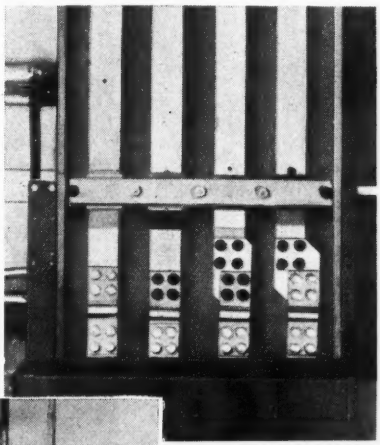
Electrically, the foundation of the scheme is a workshop distribution system which affords supplies where required of any magnitude and of any type, *i.e.*, AC or DC, variable voltages, etc. The building is a long one and at each end there is a substation at which is received an 11-kV supply and from which is taken the main 440/230-V, three-phase supply for internal distribution *via* a main intake board. The two main intake boards are similar, but to refer to one of them in detail, there are two large incoming oil circuit-breakers fed by underground cables from the substation and two smaller outgoing oil circuit-breakers, mounted on the front of a metalclad busbar chamber which is extended to accommodate two rows of air-break switch-fuses of the push-in metalclad type, fitted above and below the busbar chamber.



Each main intake board has large oil circuit-breakers mounted on a heavy busbar trunk which is extended to accommodate switch-fuses for local circuits

From the outgoing oil circuit-breakers and the bottom switch-fuses l.c. cables run in trenches under steel floor-plates either to sub-distribution boards or to the electrical utility equipment on the workshop machinery direct. From the top air switch-fuses v.i.r. cables are run through a subsidiary assembly trunking in screwed pipes to the walls and roof structure mainly to lighting distribution boards.

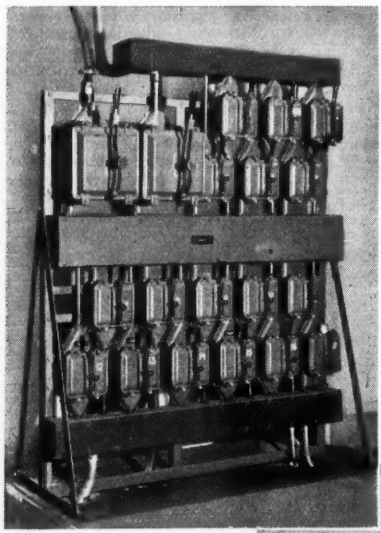
From the busbar of each main intake board there is a metalclad busbar riser which connects with one end of the heavy busbar main distribution trunk that runs overhead horizontally on the roof trusses from one end of the building to the other, except for an isolating break about midway along the line. Further distribution switchboards similar in construction to the main intake board are connected directly to the overhead busbar trunking by means of solid copper connections, to feed loads in various bays so that the



From the busbar of each main intake board there is a metalclad busbar riser which connects with one end of the heavy busbar main distribution trunk feeding sub-distribution boards throughout the length of the factory

whole load in the building can be fed from either of the two substations through this main Marryat & Place trunk system, and the connected distribution boards.

The rectangular-section heavy h.d. copper conductor bars—three phases and one neutral—are made up in 20.5 ft. lengths with bolted lap joints and a few special joints to accommodate thermal expansion and contraction. They are centrally disposed in the metalclad trunking, and are supported on specially designed glazed insulators at regular intervals. The insulators are so mounted that they carry short-circuit electro-magnetic loads in direct compression and are spaced at regular intervals of about 3 ft. along the bars.



From the major boards are fed by underground cables many sub-distribution boards, one of which is shown

The metal trunking is of stout lipped sheet-steel channelling with heavy V-shape steel reinforcing ribs welded internally to the casing at each insulator position. With various containing and supporting bars, these ribs constitute the anchoring means for the insulators. The front of the channelling is normally covered in with removable inspection covers with close-fitting lips.

The main distribution trunk is tapped at several points at each of which a "drop" serves a major distribution board similar in construction to the main intake boards. From the major boards many sub-distribution boards comprising air-break push-in switch-fuses for individual machines and circuits are fed by underground cable.

The main trunk distribution scheme which we have described is the mainstay of the comprehensive electrical utilisaton scheme throughout the building, from which are obtained directly or indirectly all conditions and magnitudes of supply.

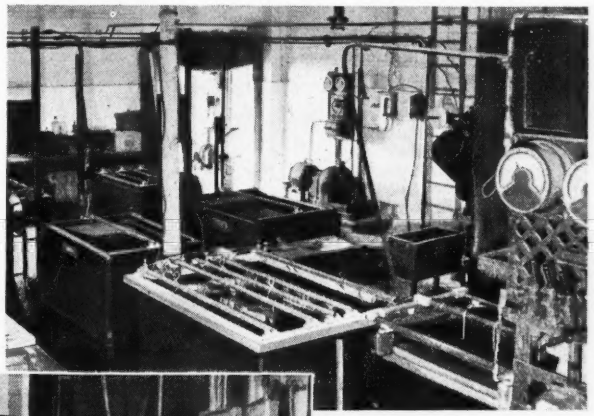
We think it will best help the reader to obtain the impression we wish to pass on if we do not attempt to classify in any way the supplies, equipment and operations which we saw, nor to describe the equipment in any great detail, but to refer in a rather general way to a selection of some of the things we noted, so as to indicate their widely varying character. To get the correct perspective of the idea on which this article is based, however, it is necessary to bear in mind all along the essential relationship between the main distribution "backbone" and electricity utilisation.

Direct current is used fairly extensively in the shops and particularly in the instrument testing section where many different voltages are required. To meet these demands there is a comprehensive installation including a 250-kW, 440-V, DC metalclad mercury-arc

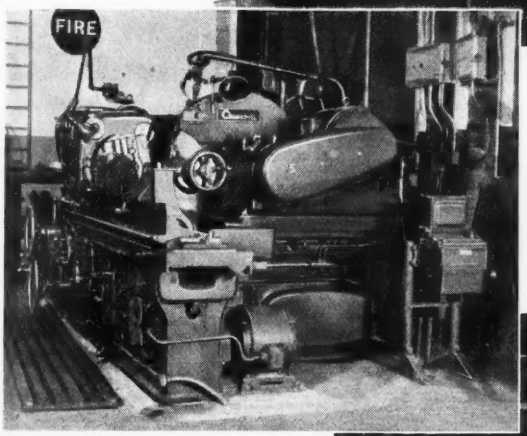
To meet the DC demands there is a comprehensive installation including rectifier and m.g. equipment and an open-front switchboard

rectifier and two 3-kW glass-bulb mercury rectifiers, one for 220 V, DC and one for 110 V, DC, as well as a m.g. set with two 6-kW generators, one for 24 V, DC and the other for 12 V, DC. All this equipment is fed from one of the major or subsidiary boards of the main distribution scheme, while distribution of the actual DC supplies is effected from an open-front flat-back switchboard.

This equipment does not, however, include that for the special DC supplies in the plating shops. In one of these shops the various equipments for chromic, cadmium, copper and silver plating, including a rotating plating vat, are served by two 10-V m.g. sets, one of



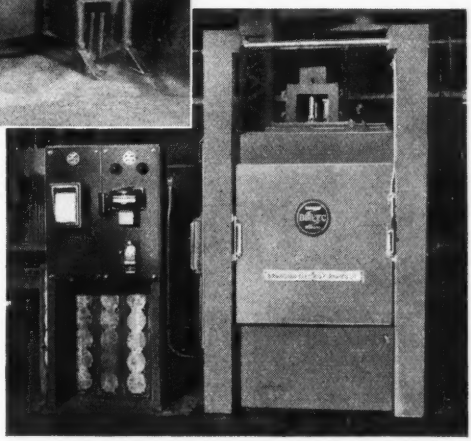
Equipments for chromic, cadmium, copper and silver plating are served by two 10-V m.g. sets



Above : A large grinding machine for dealing with cranks and journals has a 40-in. grinding wheel
Right : A single-zone furnace employed for stud-extracting operations is loaded at 24 kW

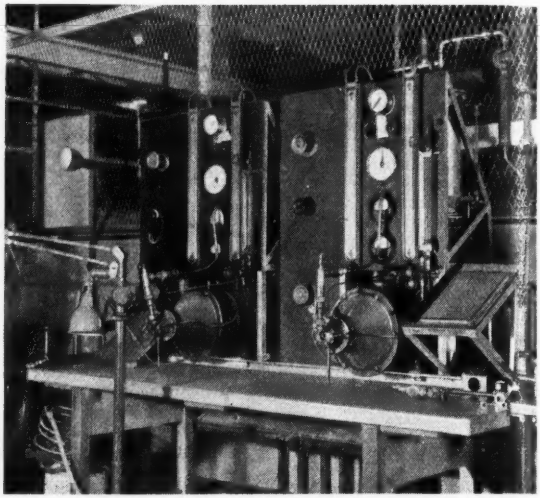
350 A and the other of 100 A. An anodic installation is served by a 30-V, 1,000-A m.g. set housed in a separate room. This process is really the reverse of plating in that the surfaces of the light alloys treated are removed, leaving aluminium oxide coverings which are impervious to corrosion.

The machine shop is one of the heaviest load centres of the whole establishment and it contains four of the subsidiary distribution boards referred to. A large grinding machine in this section for dealing with cranks and journals has a 40-in. wheel which is served by a 25-HP motor. The complete wheel unit is moved transversely by hydraulic power, with final hand-controlled vernier adjustment. The motor-driven hydraulic unit is located on the grinding machine itself, which also incorporates motors for the headstock and for the cooling-water system.

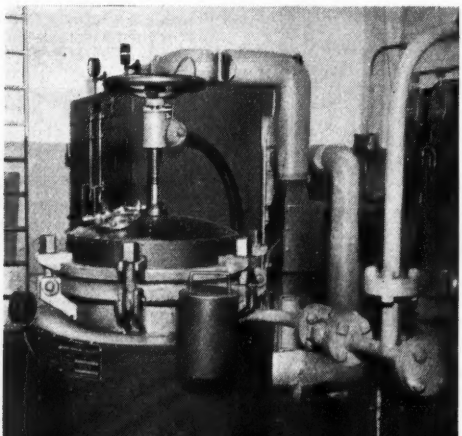


Among the many other interesting motor-driven machines in this shop is a horizontal planer which will accommodate a bedplate up to 4 ft. 6 in. long, and a lapping machine for the final finishing of bearings. A crankshaft mounted horizontally on the latter machine is itself motor driven, and on each bearing there is clamp-adjusted a pair of polishing segments which are "carried" round with the bearing, the segments being mounted on the end of an arm which is suitably guided to control the movement of the polishing members. Electrically heated stoving ovens and paint spraying booths are also associated with the machine shop. Above the booths there is an extractor trunking system fitted with motor-driven fans for the removal of the fumes from the booths.

Some of the shops are equipped for various heat treatments, etc., and we saw a low-temperature (0–350 deg. F.) single-zone furnace which is employed in connection with stud-extracting operations, etc. It is loaded at 24 kW and the elements are supplied at 400 V. A motor-driven fan at the top of the chamber maintains uniform heating conditions. Each of three oil-fired annealing furnaces has its own 2-HP blower and thermostatic control to ± 5 deg. at 400 deg. C. Each of the oil-fired salt-bath furnaces for normalising rivets has a fuel pump and fan on a common motor drive, while a large salt-bath furnace for treating air screws is similarly equipped with a 3-HP motor on the burner system. The oil is preheated by an immersion-heater unit in the oil-pipe system just before the entry to the furnace. The operating temperature is 490 deg. C. and control is by a two-pointer regulator.



Each hydraulic test rig is served by a DC variable-speed motor directly coupled to the pump (not shown) on test



An impregnation installation includes a vacuum-pressure tank and a drying-out oven (in the background)

Another healthy load centre of the establishment is the group of metal-workers' and allied shops. Simple guillotine shears have a 2-HP motor belt drive and a sand-blasting equipment has a 2-HP motor-driven "gun." A vibrating drop hammer which is used for straightening out sheet metal has a simple motor drive with belt transmission on to a crank from which the hammer proper is directly operated, a spring taking up the shock. A nibbling machine for cutting out plate to any shape by a series of punches operates in similar fashion, a small motor driving the crank-head which serves the punch *via* a 3-step pulley system.

We saw an oxy-acetylene machine make a clean cut speedily and easily through a 4-in. block of steel. The burner below operates in sympathy with the guiding mechanism above on which a small motor drives a pair of rollers which "feel" the faces (one roller on each side) of vertical strips which constitute the pattern for the path of the burner.

A pneumatic hammer incorporates its own 15-HP motor-driven compressor, while smithy equipment includes double-forge units served by 2-HP motor fans and single forges with ½-HP drives. The equipment of a welding bay includes an AC transformer set.

In the electrical repairs department there is an impregnation installation which includes, in addition to a modern vacuum-pressure tank, an electrically heated drying-out oven. An accumulator repairing section is equipped with petrol-electric charging sets.

Among the wide variety of particularly interesting testing equipment which we saw are some hydraulic test rigs for testing, after overhaul, the aircraft hydraulic pumps which operate the gun turrets, etc. Each test rig is served by a 400-V, DC variable-speed motor directly coupled to the test-stand-mounted pump.

On each of a number of magneto running-in test equipments a variable-speed DC motor transmits by belt up to a set of speed pulleys serving a horizontal shaft from which six bench-mounted magnetos are driven by light ropes. Modern electrical crack detection equipment in the propeller department adds to the interest of the testing plant generally.

We conclude with a word on the carpenters' shop where there are some excellent examples of individually driven woodworking machines, and the foundry where there are oil-fired, open-hearth and cupola furnaces and a core stove, all served by motor-driven fans, but we wish to emphasise that the extraordinarily wide variety of equipments referred to are merely selections from the whole, made, somewhat haphazardly, to stress a particular aspect of the installation.

Factory Plant Mishaps

An Inspector's Experiences

By S. Lees

EFFICIENT welding of machine parts involved in a repair job demands expert workmanship, and if the process promises only a slight advantage in cost over replacement the latter is to be preferred.

As an illustration of this a motor, which had been previously in satisfactory use on a plain flat-belt drive, was taken from stock and coupled direct (by flanged flexible coupling) to a rotary air compressor. Soon after starting up the compressor the motor shaft sheared off at the coupling end close to the coupling boss. Examination revealed the cause of the failure to be the existence of two old worn key-ways which had been filled in by the deposition of metal.

This repair had stood up to the original belt drive because the filled-in key-ways were well inside the driving pulley bore, and the shaft being otherwise sound easily carried its load. It was found that fractures had developed at the blind ends of the key-slots at which points the shaft failed. Under the new running conditions the exposed faulty section of the shaft was subjected to abnormal torsional strain which rendered it unsuitable for direct driving and the motor should not have been selected for such duty.

The transference of electrical plant from an old to a new site may present unforeseen problems somewhat out of the ordinary run, particularly where plant changes hands and has to be dismantled. For example, a standard type steam-driven, direct-coupled alternator and exciter, which had been available for inspection under running conditions, was purchased at a sale. The purchaser decided to make his own arrangements for dismantling, removing and re-erecting the plant. After the plant had been in operation for a short period on normal load at its new site the shaft extension carrying the exciter broke clean off on the exciter side of the half-coupling, at a point where the shaft entered the coupling boss. The fractured surfaces were clean and the shaft proved to be free from defects. A test bar was fixed and it was found that the exciter armature shaft was considerably out of alignment with the exciter bearings.

Close examination revealed that originally the exciter feet had been fitted with shim-plates which had evidently been overlooked during removal of the plant. A complete new armature was obtained and the shaft was carefully lined up with bed-plate shims to correct the mal-alignment. The purchaser would have been better advised to have taken advantage of the vendor's offer to dismantle the plant, since he would have had some measure of protection in the event of negligence or failure to deliver the complete machine, including accessories.

Out of the stereotyped run of survey work was an instance of a large single-shaft-coupled alternator and exciter, fitted with rope-driving pulley and mounted on a combination box-type bed-plate, which had been bought at a sale. Arrangements were made for

transporting the plant by road to its destination some hundreds of miles distant. The purchaser took out a transit accident insurance from site to site. During unloading at the purchaser's factory, when the machine was within a few feet of ground level the lifting tackle broke and the load crashed to the ground smashing the bed-plate, buckling the shaft and causing various minor damages to the alternator and exciter.

At first the damage appeared to the inspector carrying out the survey to be too extensive for a repair job. The owners made a tentative claim for compensation under the policy, but after a further survey they agreed conditionally to the machine being repaired. The conditions provided *inter alia* for a complete new bed-plate, new shaft and all renewals or repair of damaged details. This mishap occurred before the new Factories Act, 1937, came into force. The primary cause of the failure of the lifting tackle were defects which would almost certainly have been detected under compulsory inspection.

Centrifugal high-pressure blowers or fans are subject to breakdowns more often from a lack of understanding of wind mathematics than from electrical faults. For example, an S.O.S. was received for the investigation of a stoppage of a squirrel-cage motor coupled to an iron-foundry cupola blower. The rotor bars were found to be open-circuited due to fused joints in the end-rings, which were repaired on site, enabling blowing to be resumed after only a short delay. The stator windings gave satisfactory test results, but showed signs of excessive overheating which apparently had been gradual, since the circuit-breaker had not tripped and the circuit fuses were intact. The cause of the breakdown was eventually traced to the blower having been run for a period on a thinly charged cupola with the delivery pipe blast-gate open full bore.

Centrifugal Blower Precautions

Operators do not always appreciate that the power taken by this type of blower depends upon the amount of air delivered and that if the resistance to the air current decreases materially the driving motor will be overloaded. Hence, a blast-gate in the air line is necessary, particularly if a non-variable-speed motor be used. An ammeter should always be fitted. With blowers of this type when the resistance is too high the air is simply forced out of the inlet side of the blower without any detriment to the machine. This effect is common to all blowers not of the positive type.

During an inspection of a gasworks electrical plant a motor-driven coal-gas compressor, which had passed the usual static tests, was run up. Just after switching over there was a loud report, which was due to the attendant having forgotten to open the gas-inlet valve to the meter in series with the pipe line to the compressor, with the result that the meter (sheet-metal case dry-type) had collapsed due to the vacuum created by the compressor pulling (exhausting) on a void meter. A new dry meter was coupled up and another attempt was made to give the compressor a trial run, but meter No. 2 crumpled up owing to similar forgetfulness.

An inspection was being carried out on motor-driven pressure fans delivering air through filters by sheet-metal ducts, the starting switches being remote from the motors. The inspector took it upon himself to start up one of the motors, but immediately heard a frenzied shout to shut down. The air pipe-line traversed a room where fine-colour spraying was normally in progress but which fortunately on this occasion was not in use. The ducting was fitted with branches provided with hand-holes, the covers of which had been removed for inspection, so that the unfiltered air escaped violently, scattering dust and other light matter all over the room.

Broken Phase Leads

Repairs to a three-phase squirrel-cage motor entailed the renewal of one incoming phase lead to the stator. After a short run another phase lead broke. This was repaired, but owing to production exigencies an investigation of the cause was not then practicable. Not long afterwards the third phase lead failed. On this occasion there was visible evidence of the primary cause. The stator shell had moved circumferentially in the frame casting, due to defective locking, and the strain on the phase leads had severed them in turn. In most cases the three phase leads (in commercial machines) are of different lengths and the shortest cable took the first strain. Curiously the terminal base was not damaged.

A slip-ring three-phase motor had been given a typical " busy-works " cleaning. As complaints had previously been reported of delayed acceleration during starting periods, the starting switch was also " gone over." When the motor was switched on again it made only spasmodic attempts at running and the circuit-breaker repeatedly tripped. The bearings (recently new) were found to be in order and the usual insulation-resistance tests gave good results. The air-gap measurements, however, showed abnormal variation.

The motor was then completely dismantled and after a thorough cleaning it was discovered that the stator bore and rotor surfaces were deeply scored, worn and pitted, the slot teeth being ground away. The motor, of the conventional protected type, was driving an abrasive grinding plant. No external protection was provided to shield the motor from the abrasive, which had accumulated inside the machine, and the continual lapping action caused the abnormal wear in the stator bore.

The Coal Position

A Suspended Rationing Scheme

TWO methods of bridging the gap between the increasing demand for coal by war industries and the declining output from the collieries are provided for in the White Paper on Coal (Cmd. 6364, Stationery Office, 2d.). The first is to reduce the normal shrinkage in the number of miners employed by returning 7,800 men from the Forces and 3,500 from industry and civil defence. Coal mining will become a priority industry to which men not deferred in their present work may go instead of being called up for military service.

The second method is to increase the efficiency of the industry by raising the output per employee. This would result from concentrating on the more productive seams, extending mechanisation, grouping pits for obtaining the most competent mining advice and reducing absenteeism.

Methods of Control

Full control over the operation of the mines is to be taken by a responsible Minister under the Defence Regulations to ensure maximum production pending a decision by Parliament on the future of the industry. A National Coal Board will be established under a Controller-General, assisted by directors of labour, production, services and finance. A Regional Controller will exercise the Minister's powers in each coal-producing region. He will be assisted by three directors concerned with technical and engineering aspects, labour questions and public services, *viz.*, gas, electricity, and transport and distribution of coal.

A Regional Coal Board representing coal owners, managers, technical staff and miners will advise the Controller regarding means of achieving maximum output. The owner of each colliery will nominate a single person to be responsible for carrying out the directions of the Regional Controller. Pit production committees will continue to function.

Securing Economies

Apart from the increase in output expected from this reorganisation substantial economies in consumption will be needed. About three-fifths of the total coal output is consumed by industry and transport, either directly or as electricity and gas. Economies in industry can be effected through improved methods of combustion and through the allocation of coal to industry by a similar system to that in use for allocating raw materials.

The view is expressed that the most effective method of rationing domestic fuel would be by a "points" scheme, but that this need not be introduced at once. The public is urged, however, to restrict fuel consumption voluntarily to the proposed ration basis.

The fuel rationing scheme provides for a ration for each household and also for each person. Coal will be interchangeable with other fuels on the basis that 1 cwt. of coal or coke equals 100 kWh, 5 therms or 2 gals. of paraffin. The household ration varies with the locality and the number of habitable rooms, ranging from 25, 30 and 40 cwt. per annum for one-roomed houses in the south of England, the Midlands, and Scotland, and the north of England, respectively, to 55, 70 and 85 cwt. for seven-roomed houses in the corresponding districts. For households containing more than seven rooms (15 per cent. of the total) the ration will depend on the number of residents in excess of four. The personal ration is 7½ cwt. per head per annum. Supplementary rations (*e.g.*, in sickness and bomb damage) may be granted by the local Fuel Overseer.

Penalties for Excess Consumption

During any half-year electricity consumption must not exceed that for the corresponding six months of the previous year except with the consent of the Fuel Overseer. Any small excess over the amounts permitted will be deducted from the ration for the next period. A large excess may result in prosecution and a fine of ten times the price per kWh, and in extreme cases the cutting off of the supply.

Buildings other than domestic or industrial premises will be rationed on consumption in a preceding period. They will also be subject to restrictions on extravagant use of heat and light.

Coupons will be handed over when payment is made, though for solid fuel they may be deposited with the order. Any of the fifteen spare coupons in the clothing ration book may be used as the personal ration to purchase ½ cwt. of coal or its equivalent. Meter readers will need to collect coupons only when they collect cash. They should read both electricity and gas meters, as is done by arrangement between the County of London Electric Supply Co. and the Gas, Light and Coke Co.

These scales will, it is estimated, produce a total saving of ten million tons of coal in a year, but will involve no reduction for about a quarter of the total households.

NEW BOOKS

The Foreman's Task. Electrical Engineering Textbook.

Introduction to Foremanship. Edited by H. McFarland Davis, F.I.I.A., for the Institute of Industrial Administration. (Pp. 200). Macdonald & Evans, 8, John Street, Bedford Row, W.C.1. Price 8s. 6d.

In the drive for ever-increasing production the position of the foreman, the "N.C.O." of industry, assumes greater importance and it is essential to secure the right type of man and ensure that he is educated for the job.

The introductory section of this book outlines the structure of modern productive industry and shows that the foreman, to all intents and purposes, has become the manager of his department where he is advised about labour, planning, piece rates and costs, in order that he can get better results. In addition, he is leader and "father" to his men and women.

Later sections of the book deal with the foreman's part in production organisation and planning; the elements of labour management; and costing (including rate setting and operation planning). The final section gives guidance to the foreman in the selection of appropriate books and the way in which to read them. A list of publications forming a reading course is given and an appendix sets a number of examination papers on foremanship and works supervision.

Foremen should derive a good deal of valuable assistance from the book, although many may feel that the price might be lower.—J.H.C.

Electrical Engineering, Vol. II. By W. Tolmé MacCall, M.Sc., M.I.E.E. Pp. 463; illus. University Tutorial Press, Ltd., Clifton House, Euston Road, London, N.W.1. Price 15s.

A good idea of the scope of this book is afforded by the statement in the preface that it is intended to cover the fundamentals of all branches of electrical engineering dealt with in the usual three-year day course and to be suitable for the Higher National Certificate courses (A2) and much of the post-certificate classwork, considered to correspond to the final grade of the City and Guilds of London Institute examination in Electrical Engineering Practice. This claim can only be justified if Vol. I is included and, except for a few obvious defects, a successful textbook for these purposes is here available. It is based upon the author's "AC Electrical Engineering," subjects such as the symbolic notation method of AC circuit calculation, symmetrical components, mercury AC rectifiers and thermionics now being included. The older book is so well known that it will suffice here if comment on this volume is confined to a few points.

Chapter I on symbolic notation contains, in addition to the application to impedance admittance and power, the useful application of the method to the calculation of the respective loadings of transformers in parallel which, of course, can be applied to analogous problems of transmission lines. The chapter on instruments for AC only is not up to the standard of most of the others. Instrument transformers and their errors are explained without a vector diagram of an instrument transformer and the standard two-wattmeter method of three-phase power measurement is "proved" only by putting $\cos 30° = \frac{1}{2}$, and the power factor obtained from the wattmeter readings by introducing $\sin 30 = \sqrt{3}/2$. With line values, the reactive volt amperes is given as 3VI.

The division of three-phase power and its measurement between Vols. I and II makes it difficult for the student unless he carries his reading on from Vol. I, Ch. VI, Art. 6, to Vol. II, Ch. III, Art. 10. In this section and generally, the vectors are labelled by the letters of the alphabet instead of, say, V_1, V_2, etc., for voltage and I for currents, which would make the vector diagrams more self-explanatory and constant reference to the text unnecessary.

The following chapters on alternating-current machinery and the mercury arc rectifier are well done. The work on thermionic valves is practically confined to the characteristics of the triode. The screen-grid and pentode valves are described in too general a way to be really useful and photographs of these valves are not good substitutes for connection diagrams. The diagram of a valve-rectifier circuit reproduced on p. 346 might have had the polarity marked on it.

Transmission line regulation problems are confined to short lines and the notes on circuit-breakers make no reference to the oil circuit-breaker, although protective systems and the use of reactance in power work are dealt with.

A good feature of the book is that questions with numerical answers are given with most chapters.—S.P.S.

The Electrical Equipment of Automobiles. By Dr. S. Parker Smith, D.Sc., M.I.E.E., Assoc. M. Inst. C.E., Professor of Electrical Engineering at the Royal Technical College, Glasgow. Fourth edition. Pp. 204; figs. 131. Chapman & Hall, Ltd., 11, Henrietta Street, Covent Garden, London, W.C.2. Price 9s. 6d.

The new edition has been thoroughly revised and enlarged. Greater attention is given to starting conditions, the compensated automatic voltage regulator, ignition and such matters as the laws of light underlying the design of headlamps and avoidance of glare, and the laws of sound underlying the design of motor horns.

Plastics in Industry. By "Plastes." Second edition. Pp. 248; illustrated. Chapman & Hall, Ltd. Price 15s.

Apart from revision and additions to various chapters, a new chapter (XI) of three pages with four illustrations has been inserted on the uses of plastics for hot and cold insulation. An index is provided and there is in addition a fair bibliography.

Short Wave Wireless Communication. By A. W. Ladner and C. R. Stoner. Fourth edition. Pp. 573; figs. 342. Chapman & Hall, Ltd. Price 35s.

The Steam Boiler Yearbook and Manual. By Sydney D. Scorer, A.M.I.Mech.E. Pp. 399; figs. 271. Paul Elek, 39, Parker Street, London, W.C.2. Price 20s.

Porcelain Insulators

Design in Relation to Manufacturing Processes

By E. Rosenthal,
Dr.Ing., A.M.I.E.E.
(Ceramic consultant to Bullers, Ltd.)

VERY often electrical designers base their designs for ceramic insulating parts on the manufacturing methods adopted for other materials (*e.g.*, plastics and metals) with which they are more familiar, but these may not be the best in the circumstances. While collaboration between the designer and manufacturer of ceramics is usually necessary it is often useful if the first design takes into account manufacturing considerations.

"Hewlett" insulator string possessing high electro - mechanical characteristics. Suspension insulators are usually manufactured in the plastic state by jollying. Exceptionally, they are also produced by other processes, e.g., hot pressing or casting

Methods of shaping ceramic materials are based on the plastic quality of the china clay and ball clay in the case of porcelain, and of clay, talcum or bentonite in the case of high-frequency ceramic materials. The term "plastic" is applied to "anything which can be deformed under mechanical stress without losing its cohesion and is able to keep the new form given to it" (Carleton Ellis).

The plasticity of ceramic materials is caused by the adsorption of water at the surface of the Kaolinite crystals which form the china clays and the ball clays. This water surrounds the clay molecule. The forces which attract the water to the molecules and crystals are electrical in origin and impart to the clay molecules their colloidal and plastic nature. The hygroscopic water and the "water of formation" form the colloidal gels which give to the clay particles their plastic characteristics. All ceramic plastic materials also contain chemically combined water of crystallisation.

Although ceramic articles can easily be shaped as a result of the plasticity of their raw materials, the finished ceramic insulating materials owe their physical and mechanical properties to the crystals and to the glass matrix which are formed during firing at high temperatures to which they are subjected after shaping and drying. During the latter processes the water in various states is evaporated and in consequence the fired articles leave the oven smaller by from 10 to 18 per cent. than the original size.

Shrinkage is not equal, but is dependent on the quantity of water absorbed in the article when originally shaped. Its value varies with the direction of the pressure brought to bear during shaping and the direction of the stresses imposed upon the insulators by their own weight during firing. For this reason manufacturing tolerances have to be allowed.

Support insulator for transmission lines (manufactured by jollying) under 3,000 lb. bending load

In contra-distinction to ceramic plastic raw materials, the plasticity of organic plastics (also extensively used as insulation) is not caused by water but by the long chains of carbon atoms or arrangements of carbon atoms with other elements of which their molecules consist. These chains are arranged in various forms, such as long bundles or micelles and in tangled masses composed of threads.

During manufacture plastic organic

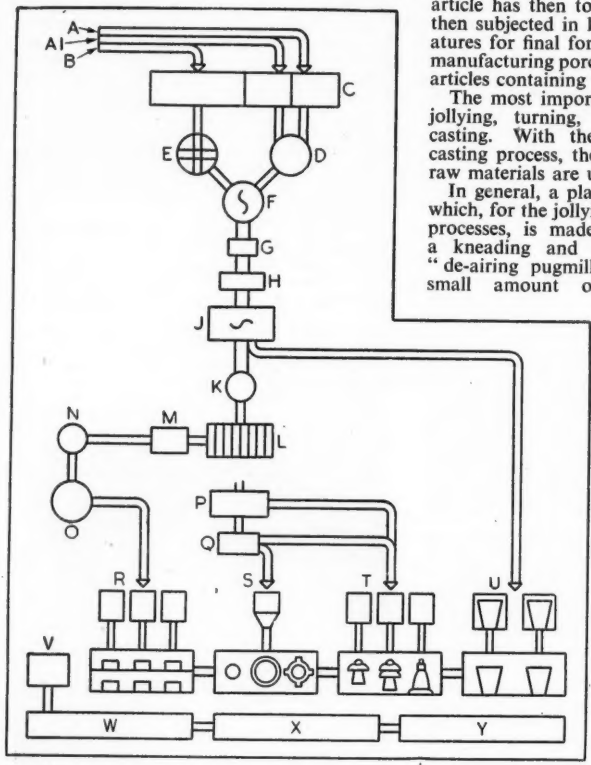
materials are transformed by heat (or by heat and pressure) into a non-plastic state, no water or other material being evaporated. Only the structure of the big molecules is altered and no, or only very small, shrinkage occurs, so that greater accuracy in certain shapes can be obtained from organic-plastic than from ceramic materials. Incidentally, the molecules of ceramic plastic materials are built up by silicon compounds, whereas the molecules of the organic plastic materials are built up by carbon compounds—an instance of the many similarities of these two elements. With organic plastic materials, transformation from the plastic to the non-plastic modification, which gives the materials their mechanical and electrical characteristics, takes place at about 180 deg. C. In the case of ceramic insulating materials the formation of the crystals and the glass matrix, which imparts these characteristics, takes place between 1,300 and 1,400 deg. C.

The difference between the manufacture of ceramic and other materials, such as metal parts and organic plastic materials, is therefore that the article is not shaped from ready-made material but has first of all to be prepared from various plastic and non-plastic substances. After the water is removed in a filter press the body is homogenised and out of the homogenised plastic body the article is shaped into the desired form. The shaped article has then to be dried and glazed and then subjected in kilns to very high temperatures for final formation. The methods of manufacturing porcelain and low-loss ceramic articles containing talcum are very similar.

The most important shaping methods are jollying, turning, pressing, extruding and casting. With the exception only of the casting process, the plastic properties of the raw materials are utilised.

In general, a plastic body is first prepared which, for the jollying, turning and extruding processes, is made more homogeneous in a kneading and de-airing device called a "de-airing pugmill." For casting, a very small amount of watery solution of water - glass (alkali silicate) or of sodium carbonate is added to the plastic body and the free OH ions deprive the clay particles of their plasticity and make the body liquid. For pressing purposes, the body is dried, mixed with lubricants and passed through a disintegrator.

Insulator manufacturers who cover a wide range have to use several different shaping methods. As a rule they prepare a primary plastic body as a basis for the various special bodies necessitated by the different shaping processes. Firms which employ, for instance, only the pressing process



Varying stages in the manufacture of ceramic insulation materials

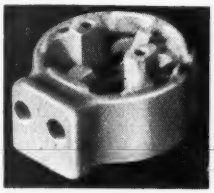
A. Supply of flint
Al. Supply of feldspar
B. Supply of clay
C. Silos
D. Grinding cylinder
E. Plunger
F. First mixing arc
G. Magneto
H. Sifting machine
J. Second mixing arc
K. Pump
L. Filter press
M. Dryer
N. Disintegrator
O. Water — oil — dry body—mixing machine
P & Q. Pugmills
R. Pressing shop
S. Extruding
T. Jollying
U. Casting
V. Dryers
W. Glazing
X. Tunnel ovens
Y. Test room

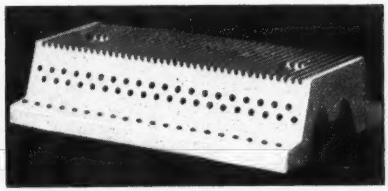
may use with advantage a dry mixing method to prepare the body for pressing. Those which employ only the casting process need not make a plastic body or use the filter press. They add to the raw materials a deflocculent (water-glass and/or sodium carbonate) and the quantity of water required to obtain a casting slip of the right specific gravity and viscosity.

The jiggering, turning, freehand throwing and jollying process is used to manufacture insulators having a round section. The body is worked on a rotating wheel (throwing) or pressed into plaster-of-Paris moulds which rotate, when by suitably formed tools the upper or inner surface is formed (jiggering) or jollying), or the body is pre-formed in the pugmill, dried to a leather-hard state and turned on special lathes.

Insulators for bushings. Such shapes are generally produced by jollying, several sections being assembled in moist condition by a suitable slip

Larger or more complicated insulators are made by assembling several sections in a moist condition, and using a slip which forms a homogeneous joint during firing. Insulators for electric power transmission lines, bushings, switchgear insulators and post-insulators are manufactured by the various plastic methods above described.





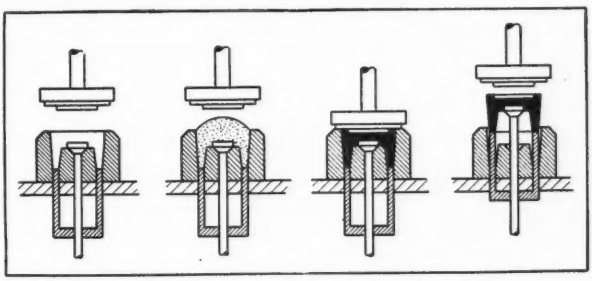
Switch base and telephone selector base produced by pressing

Long pieces of symmetrical cross-section are formed by the extrusion method. Vertical and horizontal presses are used as well as normal and de-airing pugmills. The shape of the extrusion die corresponds to a cross-section of the rod or tube to be extruded. Complicated shapes can be extruded over a wide range so long as the cross-section is uniform and symmetrical.

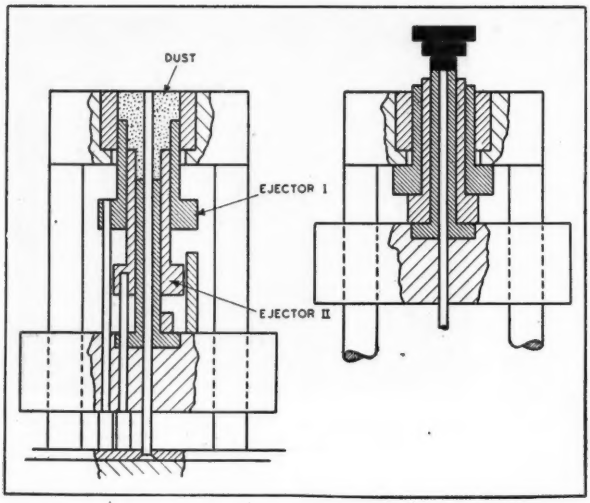
Casting is carried out by pouring the liquid slip into plaster-of-Paris moulds which absorb the moisture. When the desired wall thickness has been formed in the mould the remaining slip is poured back. This method is used especially in the casting of insulators having large asymmetrical shapes or in cases where small production quantities do not justify the expense of metal tools.

Thick-walled articles can be cast by using moulds which possess, in addition to the outer casing, a core forming the inner surface. For larger insulators, pressure or vacuum can be used also in order to expedite casting.

Pressing in steel dies is used when large



Stages in the process of wet pressing



A more complicated mould is required for dust pressing

quantities of either simple or complicated shapes are manufactured, except for high-voltage insulators, which require great puncture strength. Although the structure produced by pressing is homogeneous enough for low-voltage insulators, the puncture strength is too low, due to minute pores and air-pockets, for high-voltage work. This remark does not apply to the "hot-pressing" process, which has been developed in recent years in the United States for mass production of high-voltage insulators, and is now used successfully in this country as well. The method consists in shaping a plastic body by a heated rotating metal disc (plunger), which at the same time presses and jollys one side of the insulator, whereas the other side gets its shape by a plaster-of-Paris mould.

Wet and Dry Pressing

Apart from this hot-pressing method which combines the characteristics of pressing and jollying, there are two different methods—wet pressing and dry pressing. In the older wet-pressing method, the die is filled to excess with the body, containing enough moisture to make it plastic and some lubricant to prevent the plastic body sticking to the metal dies. Excess material is filled loosely into the die and the piece pressed by lowering the plunger, under pressure of which the plastic body flows into all the cavities of the die. After pressing, the piece is ejected from the die by lifting the ejector. The pressed piece has sufficient mechanical strength to withstand deformation when it is transferred to the dryers, during the dipping, or when the seams left after the pressing are being cleaned off.

For the manufacture of Steatite and other talcum-containing bodies, dust pressing is used to a great extent. In this process finely divided and easily flowing granulated material is made coherent under high pressure and caused to flow into and fill all the cavities of the mould. The advantages of this method are the reduction of drying shrinkage with resulting reduction of tolerances, but it is used only when great quantities are required, since the moulds are more complicated and expensive than those for wet pressing.

Acknowledgments of the author are due to Bullers, Ltd., for providing facilities for obtaining information and for placing at his disposal the photographs reproduced.

U.S. Testing Laboratories

IN accordance with American law the National Bureau of Standards of the U.S. Department of Commerce makes tests and carries out investigations for other Government agencies, but the Bureau does not itself act similarly for private individuals if other laboratories can do the work with sufficient accuracy.

There has therefore been compiled a 63-page directory (publication M.171, February, 1942. Government printing office, Washington) containing geographically and alphabetically arranged information concerning 244 commercial testing laboratories with 71 branches, and of 199 colleges that both provide instruction and also, to a considerable extent, do research work. Names and addresses are given in each case, together with indications of the commodities dealt with and nature of the tests applied. An outline is included of the certification plan in accordance with which there have already been compiled more than 860 lists of manufacturers who have expressed their willingness to certify to purchasers that materials supplied to orders based on Federal specifications and commercial standards do comply therewith.

The availability of approved laboratories, distributed throughout the States, that can be called upon to check by recognised tests the compliance of goods delivered to them is expected to induce purchasers who are themselves not individually equipped to make acceptance tests to take fuller advantage of the specification method of purchasing.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Research Needed

AS a layman who has taken some interest in electrical development, might I put forward a plea for the establishment by the Government (say for three years) of a Research Fund of £250,000 per annum, to be applied in the first instance to development and improvement in the method of "storing" electrical energy, particularly as a means of supplying power to vehicles, and secondly to encourage efforts at harnessing the potential energy available in the continual movement of sea water.

The successful solution of the sea-power problem would, I believe, have an effect similar to that of the development of steam power in placing Great Britain in an outstanding position as an industrial nation, since no part of these islands is more than 150 miles from our sea board.

Bournemouth. F. B. SUMMERBEE.

[The electrical industry has already arranged for investigating the possibility of developing new methods of electrical storage. The work is being carried out by the Electrical Research Association at the Imperial College of Science under the direction of Professor A. C. G. Egerton.—Editors, ELECTRICAL REVIEW.]

Heating Large Buildings

THE letter from Mr. D. E. Gough in your issue of May 29th, contains a proposal which deserves close examination in future town and district planning. Two main advantages to the community might be expected: (1) Conservation of coal resources. (2) Reduction in the cost of heat and electricity.

The first advantage will not be disputed as there is room for considerable economy in the use of coal by the combined production of heat and electricity. The second advantage may not be obtained so easily. Electricity is generated to-day at a very low cost in the large generating station where coal handling, coal combustion and the use of high steam pressures and temperatures have been brought to a high economic level.

The small plant is at a disadvantage compared with the large plant; it must work at lower steam pressures and temperatures and will always show lower boiler efficiencies. Local generation could share only in a small degree the advantages and might even impair the efficiency of the large generating plant. For instance, in large power stations plant shortage is now becoming as acute in the summer as in winter because of cooling water difficulties.

I would suggest that before your correspondent's proposal receives general approval more attention should be given to the use of rejected heat at the power station itself. Industries requiring heat for process work should be grouped near a large power station to take steam or hot water from it and thus ensure the most efficient use of coal.

The heating of buildings by electricity will entail heavy distribution costs because of bad load factor, but possibly not more than the community can afford to pay to ensure the best use of coal resources and freedom from dirt and smoke nuisance.

Leicester. D. H. PARRY.

Lighting in Tube Trains

I SUPPOSE there are, as "Hammersmith" suggests in your issue of May 8th, "millions" of passengers who are engaged in onerous national work and who read their newspapers and books in tube trains? Anyhow I like to think that the majority of them prefer to assist the war effort cheerfully, and are too thankful for the facilities afforded by the L.P.T.B. to bemoan their inability to read a newspaper which, *parlando con rispetto*, contains very little more of importance than can be learnt from the B.B.C.'s news bulletins.

I wonder if he would also object to what I think would make another valuable contribution by the L.P.T.B. to our war needs, *viz.*, the scrapping of strap-hangers' rubber handles, for which no doubt a temporary substitute could be found.

Westminster. J. A. SHARGOOL.

Incendiary-Bomb Detection

WHEN considering the application of automatic incendiary-bomb detectors to the premises of my company, I concluded that light-sensitive devices possessed distinct advantages over impact devices. As these should be able to accommodate themselves to slow changes, such as those due to dawn, I decided on a type of equipment that is sensitive to light impulses only rather than one incorporating a cell that is sensitive to light of any kind.

The effect of the installation of these detectors has been to increase effectively the numerical strength of our fire-watchers and fire-fighters. Inaccessible positions, which in previous raids have immobilised several men in order to watch them, are now guarded automatically and the men concerned have been freed for fire-fighting with full confidence that an incendiary bomb dropping in

inaccessible places would automatically cause the alarm bell to ring.

My experience of these equipments as a user has been such as to persuade me to introduce them to several of my friends, but the point which surprises me most is that they did not already know of the existence of such equipment.

Miss Ellen Wilkinson has bemoaned the personnel problems of the Fire-Watching Order and warned the population of the probable need of enlisting women. Before taking this step I suggest that the specifications issued by her own Department should be adequately utilised.

Manchester, 3. BRIAN W. FINNIGAN,
Director, Finnigans, Ltd.

REGARDING automatic detection of incendiary bombs, I have been interested in the application of light-sensitive apparatus in Newcastle for several important industrialists. Impact devices were considered, but mainly because of similar arguments to those put forward in the last letter you published, were not adopted.

I would like to add that these installations have proved of immense advantage to the operatives and have afforded an extra measure of security out of all proportion to the cost of installation.

Newcastle-on-Tyne. THOS. C. GRAY,
Gray Bros. (Newcastle), Ltd.

WHEN I read the correspondence in your column relative to a method of detecting incendiary bombs by automatic devices, I cannot understand why we have heard so little of them. Surely detection is 90 per cent. of the difficulty, and the Government, either through the Ministry of Home Security or Departments in charge of the A.R.P. arrangements at important factories, should encourage the use of such equipment, and thus save some of the man-power, perhaps also woman-power, for more important work.

Since reading of the existence of such equipment I have made inquiries locally and have found that several of our local factories are equipped with light detecting cells, but there are many just as important to the war effort that are not covered.

Glasgow. NORTHERNER.

Fuel Rationing

AS rationing is supposed to entail a fair distribution of a limited supply it is hard to understand the provision in the Government scheme for fuel rationing which gives as alternative values 5 therms of gas and 100 kWh.

Since a therm equals 100,000 BThU and this is equivalent to 29.34 kWh, it is obvious that under the proposed system, the gas user will have an advantage in heat values of 46.7 per cent. To substantiate such unequal values it can only be assumed that gas users require this increased amount of heat units to balance the loss in efficiency of gas cooking and heating apparatus as compared with that using electricity, but if this is so, surely we are developing an entirely wrong attitude and losing sight of the fact that the ration applies to *coal*.

By encouraging the use of more coal in less efficient cooking apparatus we may as well replace any idea of economy with the slogan " Use More Coal."

Surbiton. QUÆRE.

Encouraging Economy

YOU state on page 714 of your June 5th issue that " Economy is urgently necessary." With this I heartily agree, but, asked to decide what should be done in a home which used 720 kWh in the last quarter, I could see only a necessity to waste 30 kWh before the meter was read.

The fixed charge averages £1 17s. 6d. a quarter; for light, heat and power 450 kWh were used, and for cooking 270 kWh. The secondary charge, if 300 kWh is taken for *cooking*, is ¾d., but for fewer than 300 it is 1¼d. The two-part tariff is not duly authorised.

The cost for 720 kWh is £5 12s. 6d., but wasting 30 kWh the resulting 750 kWh cost £4 2s. 6d. Thus to save 30s. involves a waste of coal to produce the 30 units wasted. Is there any case of an authorised two-part tariff which includes a minimum consumption for one of four uses ?

Herne Bay. THEODORE STEVENS.

Production and Export

IN his article on this subject in the current issue of the *Electrical Review*, Mr. Sills begins by ingenuously—so ingenuously in the particular circumstances as to make one smile—admitting that the views expressed are entirely personal ones held by him for quite fifteen years. Well, it is close on fifteen years since I first met Mr. Sills and during that time he has not had, to my fairly certain knowledge, any direct experience in either production or export. He has, however, been closely associated with one of the large electrical manufacturing concerns, and the pontifical air of self-conscious superiority, shown by the views expressed in his article, is typical of the mental outlook often engendered by too long an association with very large business organisations.

Let us examine some of the assertive statements made by Mr. Sills. First, the four large composite manufacturing groups to which he refers are, at least in two of the cases, only a financial amalgamation of a number of separate medium-size manufacturing units. Second, it is untrue, and grossly unfair, for Mr. Sills to claim that

most of the technical development has been initiated by one or other of these large groups. With regard to the export of heavy equipment, if, as Mr. Sills says, only the large composite groups can give the facilities for the installation of such plant, then why is he so concerned about eliminating the smaller firms?

The claims made by Mr. Sills with regard to the highest type of commercial and technical training, the clean, hygienic premises and social activities and the pension scheme, which the small firm is just unable to run, are all equally fallacious. It will suffice to say that many small manufacturing concerns were giving continuous employment in happy, healthful conditions and with a generous pension scheme at a time when many of the large firms were retrenching by a reduction of staff and decrease in salaries. If Mr. Sills does not know this I shall be pleased to give him facts and figures.

Let us now take the statement that the small firm is quite unable to finance and build a high-power testing station with research laboratories. Of course it cannot, but has Mr. Sills never heard that there is a National Testing Station, open to all like the Ritz Hotel? Has he never heard of the N.P.L. or the E.R.A., to which large and small manufacturers all proportionately contribute, not forgetting the even larger contributions made by the users themselves, *i.e.*, the electricity undertakings.

No, Mr. Sills, I am disappointed. I have long held the view—about fifteen years—that national assets should be nationalised. Then you would achieve greatness and the small firms would cease to tremble. But, in the meantime, if the industry were to adopt the time-honoured tactics of a bull at a gate that, indeed, would be to bury one's head in the sand.

T. A. LONG, M.I.E.E.

East Newport, Fife.

THE opinion of Mr. G. F. Sills printed in your current issue provokes an unqualified contradiction. Both sides in the present war proclaim that they are fighting to protect the rights of minorities. The author of the article says it is self-evident that the presence of a considerable number of small electrical firms has not been in the true interest of this country.

Whatever does he think he means? What does he think we are made of? Has he in his mind the interests of the employees, of the owners, or of the persons who buy the small firms' products? What are the true interests of this country in his intention of the term and in this context? What are his definitions? If, as he says, he has discussed the matter for fifteen years, he obviously knows and could tell.

Secondly, what is a "small" firm? When does the small firm begin to be a big one? When is it noxious and at what point in its growth does it begin to be beneficent? In the third paragraph of the article he says that a small firm is unable to run a pension scheme for the people not covered by any Government scheme. An insurance company will enlighten him. During the last two slumps I was depressed beyond measure to see in the streets of this city many persons who had been the employees of large companies no longer able to pay the pensions enjoyed in better days. These are facts and very awkward facts.

Finally, the penultimate paragraph seems to mean that some engineers resent the imputation that they are not men of affairs. An engineer is paid to understand and to carry out the commission with which he has been entrusted. Let the cobbler stick to his last.

The author must remember that we are fighting to secure the right to live and let live and that this right is catholic.

*London, S.W.*1. EPIMETHEUS.

Conditions at Bingley

IN view of the fact that certain publicity has recently appeared in the technical Press affecting the Bingley Urban District Council, I would point out that the picture is not so black as painted. The policy of the National Association of Local Government Officers is that the first duty of a local government officer is to give his undivided allegiance to the authority employing him, and in this direction I would add a few brighter colours to the picture.

(1) The Council recognises the terms and conditions of service of the No. 2 District Joint Industrial Council.

(2) It recently put into operation the Whitley Council scale of salaries for administrative and clerical staffs.

(3) It acknowledges ability and encourages members of its staffs to become qualified, and to those who do so it grants an additional sum per annum.

(4) It recently recognised increases of salary to many of its chief officers.

(5) It has accepted the principle, through Nalgo, of a Joint Consultative Committee between representatives of the Council and representatives of the local Nalgo, clearly showing the desire to negotiate on democratic lines.

The Council has recently decided to withdraw from the National Joint Board, and as I have received letters asking if there are vacancies on the technical staff I would inform any intending applicants that no vacancies exist.

Bingley. O. G. COOK,
Chairman, Nalgo Branch Executive Committee, and *Chief Engineer and Manager*, Electricity Department.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT the annual meeting of the National Joint Industrial Council for the Electricity Supply Industry held in York on May 22nd, **Mr. H. P. Bolton,** president of the Electrical Trades Union, was elected chairman, and **Alderman W. Walker,** of Manchester, was elected vice-chairman for the year ending April 31st, 1943.

Mr. H. Hewitt, assistant engineer in the Wolverhampton Corporation Transport Department, retired on May 31st after forty years' service with the Department, and he has been presented by the staff and employees with a silver tea service. Before going to Wolverhampton Mr. Hewitt was with the Birmingham Central Tramways and the South Staffordshire Lessee Tramways, and for a period he was in charge of the electric cars and overhead system in Walsall. He has been succeeded as assistant engineer at Wolverhampton by **Mr. E. Singleton,** A.M.I.Mech.E.

St. Helens Electricity Committee has decided to retain the services of **Mr. W. J. S. Johnston,** the retiring borough electrical engineer, until August 30th. He was to have retired at the end of May.

Mr. H. B. Jenkins, A.M.Inst.E., A.M.I.E.E., deputy electrical engineer to the Bedford Corporation, has retired after forty years' service. He has been presented with a gold wrist watch by his colleagues and Mrs. Jenkins has received pearl ear-rings. The presentation was made by Mr. P. G. Campling, the borough electrical engineer.

Mr. H. E. Murray has been elected president of the Association of Mining Electrical and Mechanical Engineers (West of Scotland Branch), with Messrs. C. S. Buyers and J. McCann as vice-presidents.

Mr. B. Dawson, M.I.E.E., has been appointed works engineer with Macrome, Ltd. He has been with various consultants in Victoria Street, Westminster, for forty years.

Mr. R. J. Morris, who was recently appointed to the board of Edison Swan Cables, Ltd., has been elected chairman of the Cable Manufacturers' Association in succession to **Mr. Patrick Kelly,** late managing director of the Edison Swan Electric Co., Ltd.

After seven years as Tyneside area engineer, Post Office Engineering Department, **Mr. J. W. Hobson** has retired and has received a presentation from the staff. Mr. Hobson was formerly with the old National Telephone Co., Ltd. Originally he and his father were in the service of the Japanese Government and helped to introduce the telegraph service into that country.

Mr. Alex. R. Brown, district representativy of the Woolwich Borough Council Electricite Department, retired on superannuation on May 25th. He was appointed in April, 1914, and has largely participated in the development of the Department during the past twenty-eight years. Before coming south he was with Glasgow Corporation Electricity Department from 1901 and has thus completed over forty years' service in the electricity supply industry. For nearly five years he was in the electrical department of the Caledonian Railway Co. and he was with Kelso & Co., Glasgow, for seven years.

Lord Hirst last week presented **Mr. F. C. Nicholls** of the General Electric Co., Ltd., with a gold wristlet watch as a memento, from the directors, of fifty years' continuous service. Mr. Nicholls is well known among members of the electrical industry in London, Lancashire and West Riding of Yorkshire. He has served in all the sales departments of the G.E.C., travelled for fifteen years up to 1919 as sales representative in the Manchester and Leeds districts, and for nine years, until 1928, in the same capacity in London. For the last fourteen years he has specialised in church lighting and claims to have been responsible for the wiring schemes of over 400 churches and cathedrals in Great Britain, including those for Ripon Cathedral and St. Olave's Church in London.

Obituary

Lord Askwith.—The death occurred in London on June 2nd, at the age of eighty-one, of Lord Askwith, who was a director of the County of London Electric Supply Co., Ltd., the Kent Electric Power Co., Ltd., the Ramsgate & District Electric Supply Co., Ltd., and the Sevenoaks & District Electricity Co., Ltd.

Mr. A. Hick.—We regret to record the death of Mr. Allan Hick, general manager and director of Pickerings, Ltd., electric lift and hoist manufacturers, at the age of sixty-four. He had been with the company for fifty years.

Mr. Frank Greenhalgh, of Accrington, who died while visiting Cornwall to recuperate on June 4th was lighting superintendent to Accrington Corporation. He was forty-seven years of age.

Mr. H. Maitland Stronach.—In recording last week the death of Mr. Henry Maitland Stronach, for many years mains superintendent to the Glasgow Corporation Electricity Department, we regret that the name was incorrectly given as " Mr. Henry Maitland."

Fire-watching Arrangements

THE Electricity Commissioners have notified authorised electricity undertakings of the relaxation of fire-watching regulations. It is now sufficient if there is one person on duty during daylight hours for each business premises having separate fire-prevention arrangements or for premises included in small joint arrangements and three persons in the case of large arrangements. " Daylight hours " are from half an hour after black-out to half an hour before black-out; by a slip the Commissioners' memorandum makes the period half an hour before to half an hour after black-out.

The memorandum also deals with fire-watching in relation to Home Guard members and " key " men.

COMMERCE and INDUSTRY

War Damage Bill. Explaining to Employees.

Utilities and War Damage

IN the course of the debate on the War Damage (Amendment) Bill last week the Chancellor of the Exchequer made a reference to the position of public utility undertakings in this matter. He said that discussions had been proceeding for some time between the Treasury and representatives of the public utilities, and general conclusion had been reached on the major matters which would be the subject of a proposed new Bill. He was considering whether before presenting the Bill for second reading he could make it available to members for their suggestions.

Factory Ventilation in the "Black-out"

Hurried measures taken on the outbreak of war to black-out factories often resulted in serious interference with the means of ventilation and affected the health and productive capacity of the workers. Much has since been done to remedy the defects but the subject remains one of pressing importance, particularly in the summer months. A pamphlet "Factory Ventilation in the Black-out" (Form 301) was issued in the early part of the war and has now been re-issued in a slightly revised form by the Factory Department of the Ministry of Labour and National Service. It describes briefly the various measures such as mechanical ventilation, provision of light-trap ventilators and stimulation of air movement. A number of drawings are included showing simple ideas for the construction of light-traps at ventilating points such as windows and other wall and roof openings. Copies of the pamphlet may be purchased from H.M. Stationery Office or through any bookseller, price 3d. (4d. by post).

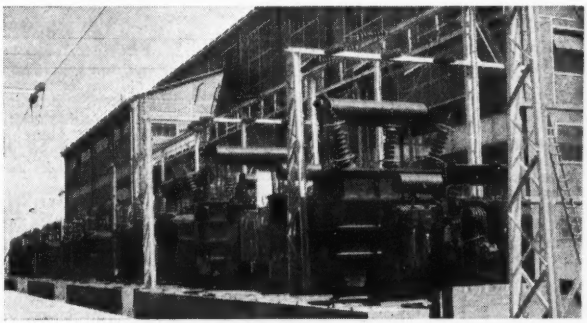
Brush Employees' Meeting

An interesting move in the direction of maintaining confidence between the directors, management and employees has been made by the board of the Brush Electrical Engineering Co., Ltd., and its associated companies, in the form of a meeting held in the staff canteen on June 2nd, when Sir Ronald Matthews, J.P., chairman of the company, addressed a large number of representatives from the many departments of the offices and works upon the subject of the company's finance. There were present Mr. A. P. Good, managing director, Mr. H. E. Midgley, Captain R. C. Petter, Mr. D. B. Hoseason, Sir Richard Pease and Mr. M. A. Fiennes, directors, and Mr. W. M. Good, managing director of Brush Coachwork, Ltd.

Sir Ronald said that he and Mr. Good felt that it would be an admirable scheme if, after the annual shareholders' meeting had taken place, the opportunity was taken of giving the same information to representative members of the large body of employees. They felt that it was important and would become increasingly so, that everyone concerned in the business of a company should have a clear picture of what was going on and why it was going on. Sir Ronald illustrated by means of coloured charts how the income of the company was allocated. Referring to the post-war problems, he said they were, of course, rightly interested in the development of international trade; under normal conditions the greater part of their output went overseas, and they had to get international trade flowing as strongly and rapidly as possible after the war.

Klip Power Transformers

With regard to the description of the 424,000-kW Klip generating station of the Victoria Falls & Transvaal Power Co., Ltd., which appeared in our issue of May 15th, we now learn that the whole output of the station is transmitted through Ferranti power transformers. For the main high-voltage transmission thirty-seven single-phase units of 13,300-kVA rating forming 40,000-kVA three-phase banks of 10,500/88,000-V ratio are installed out of doors adjacent to the power-station building. These units are of the water-cooled type with forced oil circulation. In addition, six 8,500-kVA and four 1,000-kVA three-phase units are included with more than forty small transformers for auxiliary supplies.



Twelve of the main transformers installed at the Klip power station, with two of the 8,500-kVA and some of the lower-voltage units in the foreground

A unique feature of the installation is that one three-phase bank of the transformers was subjected to a series of short-circuit tests at the testing station of the Switchgear Testing Co. at Trafford Park. In some of the tests the generator was switched on to a short-circuited transformer and in other cases the energised transformer was suddenly short-circuited on the secondary side. Both three-phase and single-phase tests

were carried out up to the full capacity of the testing station. The transformers were subjected in the course of these tests to mechanical stresses corresponding to dead short-circuits on a power supply system of 1,700,000 kVA short-circuit capacity. These conditions were considerably more severe than could arise in service. The transformers were carefully examined after tests and the unit which had received the most severe stresses was dismantled sufficiently to permit a thorough and detailed examination of the structural work and windings. No sign of mechanical stress could be detected anywhere.

For the new Vaal River power station referred to in the article sixteen similar 13,300-kVA transformers with corresponding auxiliaries are in course of manufacture. In these two power stations a total of nearly a million kVA of Ferranti transformers will ultimately be installed.

The R.E.M.E.

In its report upon Skilled Men in the Forces the Beveridge Committee recommended the establishment of a Corps of Mechanical Engineers to take over the Army's maintenance work, and a month later it was announced that the recommendation had been accepted. The new corps is now being set up. It is to be called the Royal Electrical and Mechanical Engineers and will be formed mainly by the transfer during the early autumn of personnel from the Royal Army Ordnance Corps with smaller numbers from the Royal Engineers and Royal Army Service Corps. The function of the new corps will be mechanical maintenance, including the recovery and repair of tanks in action. Simultaneously with the establishment of the R.E.M.E. there will be a transfer of R.A.S.C. personnel to the R.A.O.C. in connection with the storage and issue of vehicles and spare parts.

Advertisement Lighting Order

Since it appears that doubt exists about the effect of the Advertisement Lighting (Restriction) Order, 1942, which came into force on May 18th, the Board of Trade wishes to make it clear that the chief object of this Order is to prohibit the use at any time of electricity or other artificial illuminants for such purposes as the lighting of shop windows and show cases, except so far as the particular lighting fittings used are reasonably necessary for illuminating the general interior of the shop for the purpose of serving the public. The prohibition also applies to show cases used to display a shop's wares in premises other than the shop itself, e.g., in tube stations.

National Food Campaign

At a special afternoon conference attended by over 100 demonstrators and teachers in the E.A.W. Clubroom on June 4th, Miss G. F. Summers, H.M.I., Board of Education, gave an illustrated address on "The National Food Campaign," and quoted many interesting examples of how the teaching world and the utility companies were co-operating to bring home the food facts which would promote the health of the people. The training colleges were carrying out important work in finding the best ways of using the new foods on the market, such as processed eggs, dried milk, dehydrated vegetables. Teachers and demonstrators were all now engaged in the one pursuit of food education. Miss E. Gameson, assistant communal feeding officer for the Borough of Finchley, spoke on "British Restaurants—Equipment, Maintenance and Staffing." She mentioned the Ministry of Food's pool of equipment for canteens, from which local authorities could purchase utensils and apparatus. Miss M. H. Craig, of the Food Advice Division of the Ministry of Food, spoke on "Help Available for Demonstrations and Lectures" in the 18 Food Advice Centres in England, Scotland, and Northern Ireland. An interesting discussion followed each address.

Fuel Economy Suggestions

The contribution women could make towards obviating the necessity for fuel rationing was stressed at the annual conference of the North-Western Area of the Electrical Association for Women at Southport last week. Mrs. L. H. A. Carr, chairman, declared that if housewives could show they were "doing their bit" it would go a long way towards putting off the evil moment of fuel rationing, and she suggested that they should consult their electricity suppliers as to the advisability of changing over to other tariffs. It was certainly not fair that they should have to pay big bills while they were economising. The suggestion that water heaters should be switched off for long periods during the day was made by the Mayor, Councillor H. W. Barber, who felt that we should have to regard constant hot water for domestic purposes as almost a luxury during wartime.

Cheerful Rationing

Hints on the care of refrigerators, sewing on buttons and the growing of tomatoes are included in the June number of "Cheerful Rationing," published by the Electrical Association for Women.

Showrooms Closed

Salford has decided to close its electricity showrooms in Chapel Street for the duration of the war because of the restricted supplies of equipment and to enable the building to be used for the accommodation of other municipal staff.

Connah's Quay U.D.C. is closing the electricity showroom which occupies part of the library premises, as it is now considered to be unnecessary.

Better Tinning

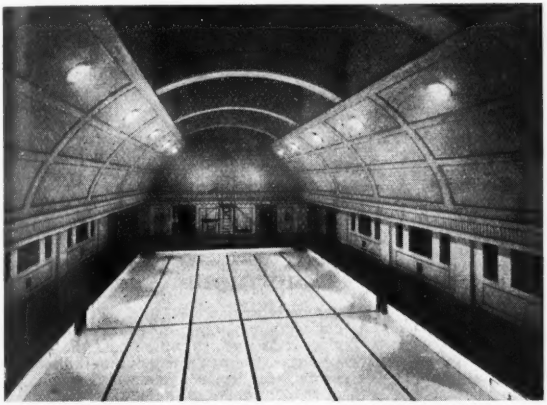
Recent researches and consequential developments are summarised in the report for 1942 (publication No. 109) of the Tin Research Institute, Fraser Road, Greenford, Middlesex. Collaboration with manufacturers and with Government departments in the application of electro-tinning to armament parts and instrument components continued during the year, and there has also been much interest in the electro-tinning in an acid bath of small soldering tags, terminals and clips. Several firms in the electrical industry have installed barrel plating plant for this purpose. Retraction, or "de-wetting," of the molten coating is a defect frequently encountered when tinning copper, usually making the coatings uneven. Oxide inclusions in the copper may be a cause in addition to baked-on films of rolling and drawing lubricants. It has been established

that wire and sheet can be tinned uniformly after certain kinds of anodic cleaning, or after certain annealing treatment.

The Institute has also collaborated in the development of acid baths for still plating when stopping-off by means of lacquers or varnishes has to be done when tinning areas or parts of articles which have to be kept soft during nitriding. Coatings of a tin-zinc alloy containing from 5 to 20 per cent. zinc may for some purposes be superior to tin alone. It has double the wear resistance of tin, is of a very pleasing lustrous appearance and resists outdoor atmospheric corrosion very well. At present this particular alloy is more easily obtained as a coating by electro-deposition than by hot dipping.

Swimming Bath Project Completed

Though present conditions have limited certain types of recreation and sport, swimming



Ceiling floodlights and a system of underwater lighting are features of this new swimming bath recently opened in the Midlands

is still providing healthy exercise for the worker. At the outbreak of war one of the principal swimming baths in the Midlands was being completely rebuilt. Materials had been ordered and most of them were " on site," but, as with many other projects, building and constructional operations were temporarily suspended. It soon became evident, however, that something would have to be done to alleviate the pressure on other swimming pools in the locality and permission was granted for the completion of this pre-war contract by easy stages. Now the bath has been put into use. The accompanying illustration provides some idea of its capacity and of its modern appearance and effective lighting.

The lighting scheme, which was designed by engineers of the General Electric Co., Ltd., in collaboration with the acting manager and secretary to the municipality, includes both overhead and under-water equipment. The overhead lighting consists of twelve 500-W flush ceiling floodlights, each comprising a front spun copper, chromium plate rim carrying a 500-W parabolic mirror reflector and a diffusing front screen. These floodlights are so arranged that an evenly diffused light of high intensity is spread over the whole of the bath area. Maintenance of the lamps and fittings is easily carried out from the " catwalk " above the ceiling. The under-water lighting system includes twelve parabolic mirror-backed reflectors, located behind rectangular watertight portholes. The light source in all units is a 500-W horizontal type Osram lamp. Apart from the decorative effect of the under-water lighting, it is of definite utilitarian value as an aid to instructors and pupils.

Furnace Construction in Johannesburg

The building of electric furnaces in Johannesburg is now being undertaken by Samuel Osborn (S.A.), Ltd., with the backing of Birmingham Electric Furnaces, Ltd., states the *South African Mining & Engineering Journal.*

These furnaces are made strictly to the " Birlec " specifications and standards and are, in fact, standard designs widely used overseas on similar kinds of work. Production is now in hand on a variety of large electric furnaces of various types.

Among these there is a fully automatic unit which is designed for the continuous heating of billets to a temperature of 1,000 deg. C. This furnace is 45 ft. long, 7 ft. 6 in. wide, and 6 ft. 3 in. high, weighs approximately 160 tons, and is rated at 400 kW. Other units at present under construction include four large electric annealing furnaces, each approximately 16 ft. long, as well as smaller and more usual types of heat-insulation bricks, transformers and switch-gear.

Change of Address

The Central Price Regulation Committee has moved to larger premises at Queen Anne's Chambers, 41, Tothill Street, London, S.W.1 (telephone : Whitehall 7010).

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be entered within a month of June 3rd.

ELKONSTAN. No. 617267. Class 9. Parts of scientific, electrical, weighing, signalling and checking (supervision) apparatus and instruments, none being parts included in other classes and all being made of common metal alloys. Mallory Metallurgical Products, Ltd., 78, Hatton Garden, London, E.C.1.

LINOTYPE. No. 618512, Class 11. Electric heating apparatus and parts thereof (not included in other classes) for use with typographical composing machines. Linotype & Machinery, Ltd., 9, Kingsway, London, W.C.2.

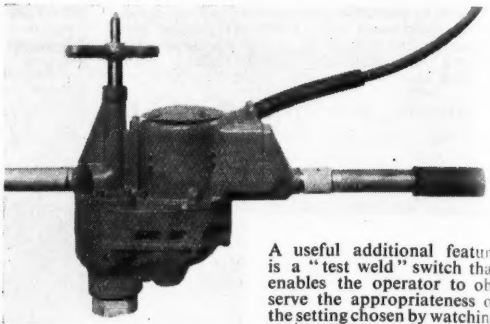
RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Shipyard Tools

THE latest portable AC tool to be announced by the CONSOLIDATED PNEUMATIC TOOL CO., LTD., Fraserburgh, Aberdeenshire, is of the "Hicycle" type for operation at a frequency above the normal 50 cycles.

Model 505, available in three sizes, is designed specially for heavy-duty drilling up to 1.5 in. and reaming up to 15/16 in. in shipyards. The tool weight is 40 lb.



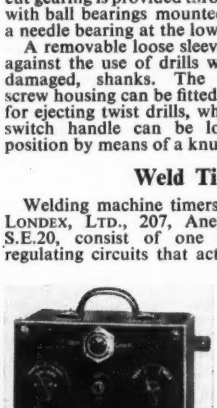
Heavy-duty "Hicycle" drill-reamer for shipyards

and its length 15⅝ in. with a 2.25-in. spindle offset. The driving motor is fan cooled, its maximum peak load rating being 2,500 W. Long through-bolts ensure rigid connection between the stator housing, gear case and transfer plate; helical cut gearing is provided throughout, with ball bearings mounted in steel inserts and a needle bearing at the lower end of the spindle.

A removable loose sleeve protects the spindle against the use of drills with badly formed, or damaged, shanks. The malleable-iron feed-screw housing can be fitted with an extractor pin for ejecting twist drills, while the rotary type of switch handle can be locked in the "on" position by means of a knurled sleeve.

Weld Timers

Welding machine timers as manufactured by LONDEX, LTD., 207, Anerley Road, London, S.E.20, consist of one or more adjustable regulating circuits that actuate an output relay of appropriate switching capacity to control the machine contactor. They are enclosed in sheet-iron casings suitable for wall or pedestal mounting. The regulating circuits are purely electrical, not dependent upon clockwork, valves, or motors, and the actual timing ranges can be altered considerably to suit particular requirements.



Weld-timing instrument

A typical example is the C-type, which has a three-position switch for spot, seam, or non-automatic welding. Three adjustable dials determine the duration of, and interval between, welds and variation of all their settings is continuous over the whole range; it is not carried out in steps. Normal ranges are approximately from one-tenth to one second welding time with similar intervals between welds for seam work and from one-tenth to 3.5 seconds for spot welding.

A useful additional feature is a "test weld" switch that enables the operator to observe the appropriateness of the setting chosen by watching an indicating lamp, built into the instrument, before actually commencing to weld. Multi-range timers can be made up when the normal ranges of standard models are insufficient to satisfy all requirements.

Thermometer Seals

AT temperatures above 350 deg. C. electrical conduction may become troublesome in the glass seals through which pass the lead-in wires of certain types of resistance thermometers. The current passing through a seal is a function both of the ordinary resistance of the seal and of the electromotive forces in the seal that result from the previous passage of current, each of which changes with the conditions of measurement. Hence the resistances should not be regarded in the ordinary sense, but rather as "effective" values, which are nothing more than the quotient of the applied electromotive force by the current observed under the given conditions of measurement.

Investigation has shown how the error in temperature measurement resulting from conduction between the sealed wires may be considerably reduced if full advantage is taken of the consequential polarisation of the glass, which is capable of increasing the effective resistance of the seal by a factor of six when the current flow is allowed to persist for several minutes instead of the more usual few seconds that suffice for temperature measurement. Just how long it will be profitable to wait cannot be accurately predicted because of the dependence of the behaviour of the glass seal on its past history. The Journal of Research of the U.S. National Bureau of Standards describes rather elaborate precautions for the elimination of errors equivalent to a few thousandths, or at most a few hundredths, of a degree which would hardly be justified in routine measurements.

ELECTRICITY SUPPLY

Scottish Rural Supplies.

Ayrshire.—RURAL ELECTRIFICATION.—The County Council at its last meeting elected six members to represent the Council on the Ayrshire Electricity Board. Referring to rural electrification, a member stated that unless their representatives were prepared to press the policy of the Council they were never likely to get the rural areas electrified. Lord Glasgow commented that representatives were elected to represent the Council to press any particular scheme affecting the Council, and they should try to get these things carried out.

Belfast.—ADDITIONAL SUPPLIES.—Should the advice of Mr. W. J. M'C. Girvan, appointed city electrical engineer, be carried out, applications for non-essential supplies of electricity will be refused. In a report last week, he suggested that the Ministry of Commerce should be asked to authorise the Corporation to take this step. In view of the number of applications being received for additional supplies directly associated with the war effort, he has found it necessary to consider the advisability of reserving the existing margin of generating plant and cable capacity for those supplies essential for the prosecution of the war. He mentioned that in England instructions had been given that additional supplies should be afforded only where they were for use in connection with the war effort, or for domestic or other purposes where serious and exceptional hardships would result if a supply was not provided. He stated that the Controller was in agreement with the recommendation.

Birkenhead.—CONSUMERS' APPARATUS.—The Electricity Committee is seeking sanction to borrow £4,000 for consumers' apparatus.

Coventry.—POWER STATION CANTEEN.—The Electricity Committee recommends the provision of additional canteen facilities at the power station at a cost of £6,300.

Huddersfield.—CONSIDERATION OF AGREEMENTS.—A sub-committee is to consider and report on the procedure to be adopted in (*a*) cases where consumers under three-phase agreements are compelled to cease production owing to concentration of industry, and (*b*) cases in which the energy used for lighting by three-phase consumers exceeds the amount consumed for power purposes.

Liverpool.—LOAN FOR EXTENSIONS.—The Electric Power and Lighting Committee is making application to the Electricity Commissioners for powers to borrow up to £55,570 for the provision of an additional supply to certain districts. For the provision of new meters application is being made for £4,000 loan sanction, and for substation plant the Committee is seeking permission to borrow £12,139.

London.—ST. PANCRAS.—In September last authority was given for the establishment of a coal dump and a total reserve of 17,000 tons was acquired. This has now been exhausted on account of the shortage during early spring, and negotiations are in progress with the appropriate Ministers for the replacement of the stock.

Restrictions in Belfast.

Middlesbrough.—LOANS SANCTIONED.—Sanction has been received by the Corporation to borrow £2,000 for mains and services and £250 for meters. The Corporation originally asked for sanction to borrow £4,000 and £500 respectively, and the Electricity Commissioners state that sanction to borrow additional sums will be given later, when the amounts now available have been exhausted.

TRANSPORT

Aberdeen.—TROLLEY-BUSES FAVOURED.—The Chamber of Commerce is to ask the Corporation to adopt trolley-buses for the city's transport services in place of trams, and is preparing a draft memorandum on the subject. The president pointed out that cities everywhere were changing over to trolley-buses and that even during the war trolley-buses had been started in Leningrad this year.

Darlington.—LOAN SANCTION.—The Ministry of War Transport has renewed its sanction given in April, 1940, to the Town Council to borrow £15,000 for trolley-buses. The Treasury has also renewed its consent with validity until the end of this year.

REPORT ON REDUCTION OF FARES.—The transport manager has prepared a report on the practicability of reducing trolley-bus fares or extending fare stages. The matter is receiving the attention of the Transport Committee.

Edinburgh.—PROFIT FROM TRAMS.—It was reported at a recent meeting of the Transport Committee that the estimates for 1942-43 showed a surplus of £27,000 on the operation of the tramways and a deficit of £17,000 on the bus services.

Liverpool.—TRAM MAINTENANCE AND POWER CONSUMPTION.—The Passenger Transport Committee has asked the general manager to prepare a statement relating to the assertion at a City Council meeting that the newer tramcars required more frequent repairs than the old trams. With a view to reducing the electricity consumed, the wear and tear of trams and the time taken to complete journeys, the manager has further been asked to submit a report containing suggestions for reducing the number of stopping points.

AGREEMENT WITH BOOTLE EXTENDED.—The Committee has renewed its agreement with the Bootle Corporation as to the repair, maintenance and working of the tramways in Bootle, which is due to expire on June 30th, 1942, for the period of the war and for twelve months thereafter.

United States.—TROLLEY-BUS STATISTICS.—A list of cities which operate trolley-bus systems, published in *Modern Transport*, shows that at August 1st last year there was a total of 2,709 vehicles of this class in forty-two towns. The largest fleet of trolley-buses (259 single-motor, 40-passenger vehicles) was at Milwaukee, Wisc., followed by Seattle, Wash. (235). At Chicago, Ill., there were 152, mostly of the two-motor type.

Colombian Imports

Increases in Power Plant and Radio Apparatus

THE chief items of Colombia's electrical import trade in 1940 are shown in the accompanying table which has been compiled from the official returns. The outstanding increases are shown in power plant and radio apparatus. On the other hand imports of telephone apparatus and refrigerators declined. The average value of the Colombian peso in 1939 and 1940 was approximately 2s. 3d., the par value being 4s.

Towards the end of 1941 stocks of general merchandise in Colombia were diminishing under the influence of an active demand. Radio apparatus was selling well, to the advantage of United States makers. The Department of Commerce at Washington reported that Germany had made an effort to keep in the market through the offer of Telefunken 1942 models. While it was thought in some quarters that they were coming direct from Germany, other opinion was that they were either being made in Argentina or being assembled locally from United States, Italian or possibly some German parts. The extensive programme of construction in Bogota has been slowed down through inadequate supply of steel and builders' hardware and to some extent plumbing materials. Hydro-electric development has been under discussion, as well as irrigation, road building and canal cutting.

The latest figures regarding electricity production in Colombia refer to 1940. There were then in operation 331 plants, of which 275 were hydraulic. Eight were operated by central or local government bodies, 168 by municipalities and 155 by private companies.

	Pesos (000) 1940	Inc. or dec. on 1939
Generators—		
Total	530	+ 77
From United States	460	+ 236
„ United Kingdom	13	+ 1
„ Germany	24	— 101
„ Switzerland	33	+ 15
Generator parts—		
Total *	9	+ 6
Transformers—		
Total	540	+ 110
From United States	360	+ 64
„ United Kingdom	40	+ 37
„ Switzerland	120	+ 68
„ Sweden	20	— 4
Parts for transformers—		
Total*	16	+ 15
Motors—		
Total	740	+ 245
From United States	690	+ 374
„ United Kingdom	10	— 20
„ Switzerland	14	+ 3
„ Sweden	17	— 40
Parts for motors—		
Total *	7	— 2
Batteries and accumulators up to 2kg.—		
Total *	36	+ 25
Batteries and accumulators over 2kg.—		
Total *	260	+ 17
Pocket batteries—		
Total *	440	— 115
Domestic appliances over 200 gr. net—		
Total	250	— 54
From United States	225	— 46
„ Sweden	20	+ 19
Radio valves—		
Total	40	†
From United States	34	†
„ Holland	6	†
Radio apparatus—		
Total	996	+ 508
From United States	770	— 208
„ Holland	160	— 82
„ Sweden	67	+ 57
Radio apparatus, automatic—		
Total	300	+ 6
From United States	290	+ 16
„ United Kingdom	7	+ 5
Radio parts—		
Total	140	— 66
From United States	124	— 51
„ Holland	13	— 1
Telegraph apparatus and parts—		
Total	28	— 17
From United States	13	— 24
„ United Kingdom	9	+ 4
Telephone apparatus and parts—		
Total	600	— 284
From Belgium	24	— 30
„ United States	124	— 8
„ Sweden	445	— 307
Filament lamps—		
Total	450	+ 49
From United States	355	+ 139
„ Italy	32	+ 32
„ Japan	21	— 5
Torches and pocket lamps—		
Total	114	— 222
From United States	96	— 112
„ Hong Kong	16	— 105
X-ray apparatus—		
Total	120	+ 57
From Germany	49	+ 21
„ United States	68	+ 38
Electro-medical apparatus—		
Total	82	— 1
From Germany	10	+ 3
„ United States	72	— 2
Measuring and registering instruments less than 1 kg—		
Total *	14	— 10
Ditto, ditto, over 1 kg—		
Total	213	+ 52
From United States	128	+ 24
„ Sweden	12	+ 8
„ Switzerland	68	+ 33
Refrigerators and parts—		
Total *	60	— 1,140
Switches, circuit breakers, etc., under 200 g—		
Total *	174	— 23
Ditto, over 200 g—		
Total	1,206	+ 404
From United States	1,140	+ 470
„ Switzerland	50	+ 12
Other electrical apparatus and materials—		
Total	347	— 95
From United States	329	+ 24
„ Canada	5	— 35
„ United Kingdom	7	— 8
Insulated copper cable—		
Total	546	+ 43
From United States	480	+ 142
„ Italy	53	+ 36
„ Canada	21	—
Porcelain insulators—		
Total	80	— 35
From United States	70	— 20
„ Switzerland	5	+ 3
Glass insulators—		
Total *	8	— 11

* Mainly from U.S.A.
† Comparative figures not available.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Brush Electrical Engineering Co., Ltd.—Presiding at the annual meeting held on June 2nd, Sir Ronald Matthews (chairman), in referring to the retirement from the board during the year of Mr. T. B. Keep, managing director, the election of Mr. A. P. Good as his successor, and the appointment of Mr. M. A. Fiennes as a whole-time executive director, said that the constitution of the board was such that it could carry through to a successful conclusion the schemes of reorganisation inaugurated in 1939. The works throughout the year had been fully occupied, and there was a further substantial increase in turnover. Since the close of the year negotiations had been concluded whereby the whole of the debenture stock would be redeemed and would be replaced by preference and ordinary stock. This conversion would necessitate an increase in the authorised capital of the company and to provide for this, and to have a margin for future development, it was proposed to raise the authorised capital to £1,500,000 by the creation of 500,000 shares of £1 each of no specified class.

A German Merger. — The *Financial Times* reports that the A.E.G. (Allgemeine Elektrizitäts Gesellschaft), Berlin (share capital Rm. 120 mill.), has taken over the Gesellschaft für Elektrische Unternehmungen, oldest and largest German electric holding company (share capital Rm. 80 mill.), with extensive interests in other Continental countries. The A.E.G. is to increase its capital by issuing Rm. 100 mill. nominal of shares to G.E.U. shareholders, who will thus receive five A.E.G. shares for every four G.E.U. shares. The amalgamation is to take effect as from September 30th, 1941, and G.E.U. shareholders are to receive a final cash dividend of 4.45 per cent. on their shares. G.E.U. investments include Rm. 40 mill. A.E.G. shares. This is one of the most important amalgamations in the German electrical industry and follows the absorption, some years ago, of the Schuckert concern by the Siemens & Halske company.

The Calcutta Electric Supply Corporation Ltd., reports a gross revenue for 1941 of £1,598,356, as compared with £1,501,264 for 1940, and a net revenue of £581,997 (against £514,250) to which is added £49,575 brought in, making £631,572. After deducting tax in India and preference stock dividend, it is proposed to pay a final ordinary dividend of 3½ per cent. actual, making 7 per cent., tax free, for the year (same), to place £23,000 to retiring gratuity fund, £50,000 to war contingencies reserve, and to carry forward £45,285. It is also proposed to distribute among the senior members of the staff in India a sum which will not exceed the equivalent of 2 per cent. of the Indian net profit. The total sales of electricity during the year were 493 million kWh (against 448.8 million kWh for 1940).

The Ever Ready Co. (Great Britain), Ltd.—Presiding at the annual meeting held on June 4th Mr. M. Goodfellow (chairman and managing director) said that during the past year for the most part the heavy demands for their productions were promptly met, but although they worked throughout the year to full capacity, there were unavoidable temporary shortages in supply to some of the general consumers. The production plans for the current year, if all went well, should enable them to continue to meet the bulk of the requirements of the general trade.

Callender's Cable & Construction Co., Ltd., has notified its intention to redeem the whole of its issued 4½ per cent. debentures at 110 per cent. on November 30th. A half-year's interest, less tax, will be paid on June 30th, and the final interest payment for the period July 1st to November 30th, amounting to 37s. 9d. per cent., less tax, will be made on the latter date. The company, however, is prepared to make payment of the redemption moneys on July 31st, together with interest in respect of the period July 1st to 31st, 1942, of 7s. 8d. per cent., less tax, to any holder.

The company is again paying a final ordinary dividend of 10 per cent. maintaining the year's distribution at 15 per cent.

The Lisbon Electric Tramways, Ltd., reports a decrease in the net profit from £142,033 to £126,588. General and depreciation reserve again receives £55,000 and the final ordinary dividend is 2½ per cent. net, making 5 per cent. net for the year (against 6½ per cent.). There was a small increase in the number of passengers carried. In a statement circulated with the report the chairman (Mr. A. N. Rye) states that while revenue is rising so are expenses and little, if any, increase in profits can be looked for. In addition Portuguese taxation will be higher this year. In spite of a coal shortage they had been able to maintain their services, having obtained a part of their power requirements from the local electricity company. It may not be possible to maintain a full service during the current year.

The Electrical Finance & Securities Co., Ltd., reports a net profit for 1941 of £62,672, as compared with £58,612 for the previous year. The final ordinary dividend is 6 per cent., plus a cash bonus of 2½ per cent., maintaining the distribution for the year at 12½ per cent., less tax. The balance carried forward is £52,226 (against £46,929 brought in).

Walsall Conduits, Ltd., announce that the net profit for the past year was £189,843, as compared with £178,107 for 1940. After meeting taxation (£112,925, against £84,962) and transferring £20,000 (same) to reserve, a final ordinary dividend of 35 per cent. is being paid, maintaining the distribution at 55 per cent.

The National Electric Construction Co., Ltd., reports a net profit of £31,952, as compared with £34,381 in the previous year, after providing £19,000 for tax. A sum of £2,363 is placed to Dewsbury and Ossett Tramways reserve, the

dividend for the year is maintained at 10 per cent., and £11,089 is added to the undivided profits account, making it £153,677.

The Rheostatic Co., Ltd., reports a net profit for the year ended September 31st of £7,100, as compared with £8,017 for the preceding year. Reserve receives £2,000, the ordinary dividend for the year is again 10 per cent., and £4,184 is carried forward (against £4,196 brought in).

Metal Industries, Ltd.—The issue of the 1941–42 accounts is being postponed until certain negotiations affecting the accounts have been completed, but a further dividend of 2½ per cent. is being paid on the "A" and "B" ordinary stock, maintaining the year's distribution at 5 per cent.

Charles Clifford & Son, Ltd., report a net profit for 1941 of £18,164, as compared with £22,505 for 1940, to which is added £20,967 brought in, making £39,131. Reserve for war contingencies receives £5,000 and it is proposed to pay a final dividend of 2s 6d per share, free of tax, making 17½ per cent. for the year. In the previous year the final dividend was 5 per cent. plus a bonus of 7½ per cent., making 17½ per cent., tax free.

Keith Blackman, Ltd., report a net profit for the past year of £43,752, as compared with £38,414 in the previous year. The dividend for the year is 20 per cent. less tax (against 17½ per cent.), and £46,524 is carried forward (against £38,772 brought in).

The Chloride Electrical Storage Co., Ltd., has declared a final dividend of 5 per cent., together with a bonus of 5 per cent., on the "A" and "B" ordinary shares, again making 15 per cent. for the year.

The National Electric Construction Co., Ltd., has declared a first and final dividend of 10 per cent. (same).

Taylor, Tunnicliff (Electrical Industries), Ltd., are paying an unchanged interim dividend of 2½ per cent.

The Electrical & General Investment Co., Ltd., has announced a final dividend of 6½ per cent., making 9 per cent. for the year (unchanged).

Ruston & Hornsby, Ltd., are again paying an ordinary dividend of 12½ per cent., less tax, for the year to March 31st.

Siemens Bros. & Co., Ltd., are maintaining the ordinary dividend for the year at 7½ per cent.

Veritys, Ltd., have announced an interim dividend of 7½ per cent. (unchanged).

Companies' Returns

Statements of Capital

Celestion, Ltd.—Capital, £123,100 in 37,500 preference and 85,600 ordinary shares of £1 each. Return dated January 13th. 35,721 preference and 25,651 ordinary shares taken up. £51,408 paid on 35,721 preference and 15,687 ordinary shares. £9,964 considered as paid on 9,964 ordinary shares. Mortgages and charges: £82,933 7s. 7d.

British N. S. F. Co., Ltd.—Capital, £13,500 in 3,000 preference and 9,500 ordinary shares of £1 each and 20,000 deferred shares of 1s. each. Return dated January 2nd. 1,100 preference, 9,500 ordinary and 20,000 deferred shares taken up. £1,183 6s. 8d. paid (£1 on 1,100 preference and 1d. on 20,000 deferred). £9,500 considered as paid on 9,500 ordinary shares. Mortgages and charges: Nil.

Faulkner & Co. (Manchester), Ltd.—Capital, £2,000 in 2,000 shares of £1 each. Return dated January 6th. 1,900 shares taken up. £500 paid. £1,400 considered as paid. Mortgages and charges: Nil.

Stanley Cox, Ltd.—Capital, £3,000 in £1 shares (1,400 ordinary and 1,600 preference). Return dated December 31st (filed January 17th). All shares taken up. £3,000 paid. Mortgages and charges: Nil.

Globe & Simpson, Ltd.—Capital, £30,000 in £1 shares. Return dated January 14th, 1942. 29,673 shares taken up. £27,023 paid. £2,650 considered paid. Mortgages and charges: Nil.

Blackburn, Starling & Co., Ltd.—Capital, £12,000 in £1 shares. Return dated July 29th, 1941 (filed February 9th, 1942). All shares taken up. £8,100 paid. £3,900 considered as paid. Mortgages and charges: Nil.

Major Equipment Co., Ltd.—Capital, £10,000 n 10,000 ordinary shares of £1 each. Return dated December 31st, 1941 (filed February 7th, 1942). All shares taken up. £10,000 paid. Mortgages and charges: Nil.

Insulation Manufacturers, Ltd. — Capital, £10,000 in £1 shares (all ordinary). Return dated April 20th, 1941 (filed February 6th, 1942). 3 shares taken up. £3 paid. Mortgages and charges: Nil.

H. W. Teeton, Ltd.—Capital, £4,000 in 4,000 shares of £1 each. Return dated January 12th. 3,870 shares taken up. £1,679 paid. £2,191 considered as paid. Mortgages and charges: Nil.

Electrical Factors, Ltd.—Capital, £500 in £1 shares. Return dated December 31st, 1940 (filed March 2nd, 1942). 200 shares taken up. £200 paid. Mortgages and charges: Nil.

Barkers' Electric Service, Ltd.—Capital, £1,000 in £1 shares. Return dated December 15th, 1941. All shares taken up. £500 paid. £500 considered as paid. Mortgages and charges: Nil.

Moreland Electric Welding Co., Ltd.—Capital £4,000 in £1 shares. Return dated January 13th, 1942. 2,302 shares taken up. £2,302 paid. Mortgages and charges: Nil.

Mortgages and Charges

Watliff Co., Ltd.—Satisfaction in full on May 8th, 1942, of mortgage, dated July 11th, 1940, and registered July 12th, 1940. (According to the register of mortgages the mortgage registered July 12th, 1940, originally secured £5,000.)

Bankruptcies

F. E. Roberts, 272, Melfort Road, Thornton Heath, and **J. Savill**, 64, Woodville Road, South Woodford, E.18, electricians, lately carrying on business under the style of Commercial Light, Heat & Power Co., 47, Poland Street, London, W.1, electrical engineers and contractors.—First and final dividend of 7s. 8d. in the £ payable any day (except Saturday) at Bankruptcy Buildings, Carey Street, London, W.C.2.

STOCKS AND SHARES

TUESDAY EVENING

STOCK EXCHANGE markets have been reading the recent news as cheerful in character and as confirming the previous impression that the power of the Allies is mounting in the provision of vital needs for victory. The huge scale of air-raids over Germany had a distinctly good effect upon Stock Exchange prices. Indirectly, this news served to bring in fresh supplies of capital to markets, where already the main difficulty was to find sufficient stock to satisfy the requirements of would-be buyers. Prices of front-rank industrial shares have had another lift during the past week, raising them to levels at which the yield on the money is little more than can be obtained from British Government securities. The reason put forward by buyers of stocks and shares at prices that appear to be inflated, is that after the war the scope for expansion in the business earnings and profit will be so considerable as to lead to largely increased dividend payments, plus the prospect of there being still further improvement as time goes on.

Capital Considerations

It may not be out of place to suggest that optimism in regard to this view can possibly be carried too far. That business will violently and immediately expand after the end of the war is incontestable, but whether companies will be allowed to make unlimited profits is not so sure. The Government has tasted what it means for it to exercise control over various departments of industry; with the experience thus gained, it may conceivably keep a fairly tight hold over profits for some time to come.

If this view of the possibilities is correct, then it must follow that the people who are paying very high prices to-day for industrial shares may find themselves faced with the likelihood of fairly heavy capital depreciation after peace comes. This line of argument, however, is of no account in such days as these, when investment appetite is keenly set to employ capital in shares which, while in first-rate concerns, offer but a modest yield on the money at the current prices.

Cable and Wireless

On the eve of the dividend declaration from Cable and Wireless, the ordinary stock rose 4 points to 62, attention evidently being drawn to the possibilities of improvement in the price, by tardy recognition of the fact that the dividend on this stock is for the full year. It was pointed out in a Stock Exchange firm's private letter to clients that, in spite of the inevitable loss of some of the company's Far Eastern business it is still handling traffic to capacity, while the Marconi Wireless Company is also full of work. Such a state of affairs, the brokers contend, will certainly continue so long as the war lasts, and if, as everyone hopes, there is a revival of trade after the war, this must also bring a great volume of business to the Cable and Wireless (Holding) Company. Whereas, it is pointed out, at the end of 1938 the profit and loss balance of Cable & Wireless, Ltd., was only £27,467, by 1940 it had risen to £1,613,607.

Manufacturing and Equipment

Siemens ordinary shares have strengthened to 27s. 6d. on declaration of a dividend of 7½ per cent. for the year, the same as that for the corresponding period twelve months ago. At the present price Siemens give a return of 5½ per cent. on the money. General Electrics keep firm at 83s. 9d. The dividend announcement is expected to be made early next month. Ever-Ready shares hardened to 32s. 6d. The chairman explained at the meeting the other day that expenses have risen more rapidly than had been met, so far, by the increase of prices to the public which took place in April last. Speculation in E.M.I. has been bowling merrily along. At 16s. 3d. the shares are again a shade higher on balance. Rises in British Aluminium, Lancashire Dynamo, Lucas and Murex, witness to the effort of the investor to obtain front-rank industrial ordinary shares.

Veritys have declared a dividend at the rate of 7½ per cent., repeating the distribution of a year ago. The 5s. shares stand about 4s. 3d. ex dividend. Enfield Rolling Mills has again declared a dividend of 2½ per cent. This has had no effect upon the price of the company's shares, which remains at 12s. 6d.

Telegraph Condenser

The Telephone & General Trust, of which Sir Alexander Roger is chairman, has been making a bid of 15s. per share for the 10s. shares of the Telegraph Condenser Co., Ltd. On the face of it, the price offered is a good one, because it is some time ago since Telegraph Condensers were quoted at anything like 15s. More recently, shares have been changing hands in the Stock Exchange market on the basis of about 12s. 6d. The company paid 5 per cent. dividend for 1940, against nothing in each of the two preceding years, but 20 per cent. in 1934 and in 1935. Holders of Telegraph Condensers have been asking what they had better do: accept the offer of 15s. or retain their shares in the hope of doing better by and by.

Probably a considerable number of shares will be sold to the Telephone & General Trust at 15s., and the effect of the transaction will be to make the market in what remains of the Telegraph Condenser shares a more or

(*Continued on page* 773)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939–40	Dividend 1940–41	Middle Price June 9	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	53/9	..	4 13 0
British Power and Light	6	6	28/6	..	4 4 3
City of London	7	7	27/6	..	5 1 9
Clyde Valley	8	8	40/–	..	4 0 0
County of London	8	8	37/6	..	4 5 6
Edmundson's:					
7% Pref.	7	7	35/–	..	4 0 0
Ord.	6	6	28/6	..	4 4 3
Elec. Dis. Yorkshire	9	9	42/–	..	4 5 9
Elec. Fin. and Securities	12½	12½	48/9	..	5 2 6
Elec. Supply Corporation	10	10	45/–	..	4 9 0
Isle of Thanet	2	Nil	11/3	..	—
Lancs. Light and Power	7½	7½	35/–	..	4 5 9
Llanelly Elec.	5½	5½	22/6	..	4 17 9
Lond. Assoc. Electric	4½	4	18/9	..	4 5 10
London Electric	6	6	25/–	..	4 16 0
London Power Red. Deb.	5	5	104½	..	4 15 7
Metropolitan E.S.	8	8	36/3	..	4 8 6
Midland Counties	8	8	39/6	..	4 1 0
Mid. Elec. Power	9	9	42/–	..	4 5 9
Newcastle Elec.	7	7	27/6	..	5 1 10
North Eastern Elec. Ordinary	7	7	31/3	..	4 9 7
7% Pref.	7	7	34/6	..	4 1 2
Northampton	10	10	46/3	..	4 6 7
Notting Hill 6% Pref. (£10)	6	6	9	..	—
Northmet Power:					
Ordinary	7	7	35/9	..	3 18 4
6% Pref.	6	6	32/6	..	3 13 10
Richmond Elec.	6	6	25/–	..	4 16 0
Scottish Power	8	8	39/6	..	4 1 0
Southern Areas	5	5	21/3	..	4 14 0
South London	7	7	26/–	..	5 7 8
West Devon	5	5	21/3	..	4 14 0
West Glos.	4½	3½	20/–	..	3 10 0
Yorkshire Elec.	8	8	40/–	..	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/9	+3d.	—
Calcutta Elec.	7*	7*	25/9	+2/–	5 8 9
Cawnpore Elec.	10	10	25/–	..	8 0 0
East African Power	7	7	27/–	..	5 3 8
Jerusalem Elec.	7	5	18/9	..	5 6 8
Kalgoorlie (10/–)	7½	7½	7/6	..	10 0 0
Madras Elec.	6*	4*	18/9	..	4 5 4
Montreal Power	1½	1½	24	+½	6 5 0
Palestine Elec. "A"	Nil	Nil	18/9	..	—
Perak Hydro-elec.	6	7	5/–	..	—
Shawinigan Power	83cts.	90cts.	14½	..	—
Tokyo Elec. 6%	6	6	11	..	—
Victoria Falls Power	15	15	75/–	+1/6	4 0 0
Whitehall Inv. Pref.	7½	5	15/9	..	6 7 0

Company	Dividend 1939–40	Dividend 1940–41	Middle Price June 9	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1950–70	5	5	110½	..	4 10 6
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	107½xd	..	4 3 7
1963–93	3½	3½	103½	..	3 7 8
1974–94	3½	3½	99	..	3 5 8
London Elec. Trans. Ltd.	2½	2½	95	..	2 12 8
London & Home Counties 1955–75	4½	4½	112	..	4 0 4
Lond. Pass. Trans.:					
A	4½	4½	117½xd	–1	3 16 9
B	5	5	114½	–1	4 7 4
C	3	2⅞	40½	..	7 2 0
West Midlands J.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	112½	..	5 6 8
Def.	1½	1½	26	..	5 15 5
Anglo-Portuguese	8	8	17/6	..	9 2 10
Cable & Wireless:					
5½ Pref.	5½	5½	100	+2	5 10 0
Ord.	4	4	62	+4	6 9 0
Canadian Marconi $1	Nil	4cts.	5/–	..	3 7 0
Globe Tel. & Tel.:					
Ord.	8½*	8½*	27/6	..	—
Pref.	6	6	27/6	..	4 7 5
Great Northern Tel.: (£10)	Nil	Nil	14½	..	—
Inter. Tel. & Tel.	Nil	Nil	3½	..	—
Marconi-Marine	7½	7½	28/9	..	5 4 4
Oriental Tel. Ord.	11½*	16	45/–	..	7 2 3
Telephone Props.	6	Nil	10/–	+1/6	—
Tele. Rentals (5/–)	10	10	8/9	..	5 14 1
Traction and Transport					
Anglo Arg. Trans.:					
First Pref. (£5)	Nil	Nil	5/–	..	—
4% Inc.	Nil	Nil	12½	+1	—
Brit. Elec. Traction:					
Def. Ord.	45	45	945	+20	4 15 3
Pref. Ord.	8	8	180	..	4 9 0
Bristol Trams	8	10	46/3	..	4 6 4
Brazil Traction	$1	50c	14⅜	+⅛	—
Calcutta Trams	8	5½	17/6	+3/16	6 5 9
Cape Elec. Trams	5	5	19/6	+6d.	5 2 7
Lancs Transport	10	10	43/9	..	4 11 4
Mexican Light:					
1st Bonds	5	5	82½	..	6 1 3
Rio 5% Bonds	5	5	97½	..	5 2 8
Southern Rly.:					
5% Prefd.	5	5	64½	..	7 15 0
5% Pref.	5	5	108½	–1	4 12 4
T. Tilling	10	10	50/–	..	4 0 0
Tilling & B.A.	7*	6½*	55/–	..	2 7 3
West Riding	10	10	39/6	..	5 1 3

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price June 9	Rise or Fall	Yield p.c.
Equipment and Manufacturing					£ s. d.
Aron Elec. Ord. ..	Nil	7½	23/–	−1/–	6 10 5
Assoc. Elec.:					
Ord.	10	10	45/9	..	4 7 6
Pref.	8	8	40/–	..	4 0 0
Automatic Tel.& El.	12½	12½	52/–	..	4 16 3
Babcock & Wilcox.	11	11	42/6	−9d.	5 3 6
British Aluminium.	10	10	44/6	+9d.	4 10 1
British Insul. Ord..	20	20	93/9	..	4 5 6
British Thermostat (5/–)	18½	18½	16/3	..	5 13 10
British Vac. Cleaner (5/–)	12½	10	11/3	..	4 9 0
Brush Ord. (5/–) ..	Nil	6	5/6	..	5 9 3
Callender's.. ..	15	15	73/9	..	4 1 9
Chloride Elec. Storage	15	15	73/9	..	4 1 4
Cole, E. K. (5/–) ..	Nil	7	11/3	..	3 2 2
Consolidated Signal	17	17	72/6	..	4 3 8
Crabtree (10/–) ..	17½	17½	29/6	..	5 18 8
Crompton Parkinson Ord. (5/–) ..	30	20	22/6	..	4 9 0
E.M.I. (10/–) ..	Nil	6	16/3	+3d.	3 14 0
Electric Construction	10	10	34/6	..	5 16 0
Enfield Cable Ord..	12½	12½	55/–	..	4 11 0
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	42/–	..	4 15 3
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel. (5/–)..	22*	20*	41/3	..	2 8 6
Ever Ready (5/–) ..	40	40	32/6	+3d.	6 3 0
Falk Stadelmann ..	7	7½	22/–	..	6 16 4
Ferranti Pref. ..	7	7	27/6	..	5 1 10
G.E.C.:					
Pref.	6½	6½	33/9xd	−9d.	3 14 2
Ord.	20	17½	83/9	..	4 3 9
Greenwood & Batley	15	13	30/–	..	8 13 4
Hall Telephone (10/–)	10	12½	20/–	..	6 5 0
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	22/6	..	4 0 0
Hopkinsons ..	15	15	48/9	..	6 3 0
India Rubber Pref.	5½	5½	21/3	..	5 3 6
Intl. Combustion ..	32½	30	107/6	..	5 11 6
Johnson & Phillips	15	15	60/–	..	5 0 0
Lancashire Dynamo	20	20	67/6	+6d.	5 18 4
Laurence, Scott (5/–)	15	12½	9/–	..	6 19 0
London Elec. Wire.	7½	7½	28/3	..	5 6 2
Lucas, J.	15	15	66/3	+ ⅛	4 10 8
Mather & Platt ..	10	10	39/6	..	5 1 3
Metropolitan Elec. Cable Pref. ..	5½	5½	21/3	..	5 3 6
Murex	20	20	92/6	+ ⅛	4 6 9
Pye Deferred (5/–).	25	25	15/–	..	8 6 8
Revo (10/–) ..	5	20	28/9	..	6 19 2
Reyrolle	12½	12½	57/6	..	4 7 0
Siemens Ord. ..	7½	7½	27/6	∓6d.	5 9 3
Smith, S. (1/–) ..	50	37½	7/–	..	5 7 2
Strand Elec. (5/–)..	2	4	3,6	..	5 14 4
Switchgear & Cow- and (5/–) ..	15	10	10/–	..	5 0 0
T.C.C. (10/–) ..	Nil	5	15/–	+½	3 6 8
T.C. & M.	10	10	41/3	..	4 17 0
Telephone Mfg. (5/–)	9	9	9/3	..	4 17 3
Tube Investments .	23¾	20	82/6	+6d.	4 17 0
Vactric (5/–) ..	Nil	Nil	6/–	..	—
Vickers (10/–) ..	10	10	16/6	..	6 1 3
Ward & Goldstone (5/–)	20	20	18/6	..	5 8 3
Westinghouse Brake	10	10	47/6	..	4 4 2
Walsall Conduits (4/–)	55	55	33/9	..	6 10 4
West, Allen (5/–) ..	7½	7½	5/9	..	6 10 5

*Dividends are paid free of Income Tax.

Stocks and Shares (*Concluded from page* 771)

less nominal one. On the other hand, if it is worth while for the Telephone & General Trust to pay 15s. for the Telegraph Condenser shares, it is probably equally worth while for the holder of the latter to retain his interest in them, and to look for an early return of the company to greater prosperity.

Brush Electrical

At the annual meeting of the Brush Electrical Engineering Co. last week the chairman, stating that he did not feel it desirable to give a detailed account of the company's various activities, assured his audience that the steady progress of the past year is being maintained. Part of his speech discussed the position of the Brush Co. *vis-à-vis* the Associated British Engineering, Ltd. The Brush has commuted an annual payment that was being made to the Associated British Engineering, issuing to the latter company £50,000 in preference shares and £27,000 in ordinary shares. The Brush capital structure is on a businesslike foundation, and shareholders are justified in expecting that the resumption of dividend payments on the ordinary shares will be continued. The preference shares change hands on the basis of 21s. 9d., and the options around 3s.

Fuel Rationing

Amongst Home electricity shares the only feature is continued improvement in the preference shares of the leading companies. Apart from these, the list shows no change since a week ago. In the Overseas group, Calcutta Electrics are a florin higher. The Stock Exchange market is following with close interest the progress of the Government's proposals in regard to fuel rationing, inter-related as these are to the problem of coal consumption. It is urged in the market that the electricity supply companies are not likely to be affected in any way by the decision of the Government. All the electricity that the companies are capable of producing will be demanded: mainly for the war effort, but also for other purposes. The difficulties of the companies will be rather concerned with obtaining sufficient supply with which to satisfy their customers than with any voluntary diminution of output.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

22978. "Telecommunication exchange systems." Standard Telephones & Cables, Ltd., and E. P. G. Wright. August 9th, 1939. (545182.)

25995. "Television synchronising and control system." Hazeltine Corporation. October 5th, 1938. (545244.)

25998. "Television receiving system." Hazeltine Corporation. October 13th, 1938. (545245.)

1940

8866. "Electric fitting." B. Herrman. May 17th, 1940. (545186.)

9870. "Method of, and apparatus for, heat treatment by electro-magnetic induction." Budd Induction Heating, Inc. June 8th, 1939. (545122.)

12705. "Electron-discharge apparatus." F. J. G. Van Den Bosch and Vacuum-Science Products, Ltd. August 7th, 1940. (Cognate application, 1693/41.) (545123.)

12745. "Electric convertor." F. Schenk and G. Leischner. March 29th, 1940. (545189.)

12807. "Apparatus for controlling the maximum demand of an electric power load." Watford Electric & Manufacturing Co., Ltd., H. Coates and B. A. Vuille. August 9th, 1940. (545150.)

13871. "Control systems for controlling the operation of vibrating electro-magnetic motors." Traylor Vibrator Co. October 2nd, 1939. (545252.)

14673. "Radio telegraph systems." Standard Telephones & Cables, Ltd., and C. W. Earp. September 28th, 1940. (545126.)

15010. "Steam generating and superheating installations." Superheater Co., Ltd., and L. C. Southcott. October 8th, 1940. (545127.)

15231. "Steam superheating installations." Superheater Co., Ltd., and J. E. Wood. October 14th, 1940. (545253.)

16309. "Salt baths for the heat treatment of metals." Birmingham Electric Furnaces, Ltd., and E. C. Hipkins. November 11th, 1940. (545255.)

16311. "Furnace wall tubes." Babcock & Wilcox, Ltd. April 18th, 1940. (545155.)

16374. "Water tube walls of steam generator furnaces." Bennis Combustion, Ltd., and A. W. Bennis. November 12th, 1940. (545158.)

16541. "Electrical signalling systems." Standard Telephones & Cables, Ltd., and W. A. Beatty. November 15th, 1940. (545260.)

17259. "Radio frequency bridges for impedance measuring purposes." Marconi's Wireless Telegraph Co., Ltd., C. D. Colchester, P. E. Jellyman and R. A. Nightingale. December 4th, 1940. (545129.)

17345. "Spreaders for aerial wires." Poles (1938), Ltd., and L. A. L. Brown. December 5th, 1940. (545263.)

17346. "Means for separating the sections of masts or poles." Poles (1938), Ltd., and W. C. Scrivener. December 5th, 1940. (545199.)

17863. "Electric lighting fittings." Edison Swan Electric Co., Ltd., and F. M. Cocksedge. December 19th, 1940. (545264.)

18195. "Dynamo-electric machines." British Thomson-Houston Co., Ltd. December 29th, 1939. (545130.)

1941

328. "Means for mounting indicating instruments on switchboards or panels." H. Lister and Metropolitan-Vickers Electrical Co., Ltd. January 9th, 1941. (Addition to 494017.) (545131.)

399. "Electric tumbler switches." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and R. W. Morgan. January 10th, 1941. (545203.)

401. "Electric switches of the intermediate type." J. A. Crabtree & Co., Ltd., H. F. McLoughlin and R. W. Morgan. January 10th, 1941. (545204.)

638. "Steam generating plant." E. G. Ritchie. January 17th, 1941. (545206.)

651. "Methods of, and means for, recording signals electrically." Creed & Co., Ltd. January 19th, 1940. (545132.)

738. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and R. Pohl. January 20th, 1941. (545266.)

897. "Temperature measuring apparatus." British Thomson-Houston Co., Ltd. January 27th, 1940. (545227.)

1647. "Electric welding processes." D. Adamson & Co., Ltd., and E. J. Heeley. February 7th, 1941. (545228.)

1668. "Electrical apparatus for indicating displacements of movable members." N. R. Davis and Sun-Vic Controls, Ltd. February 7th, 1941. (545133.)

2055. "Assembly of electro-magnetic induction apparatus." British Thomson-Houston Co., Ltd. February 14th, 1940. (545229.)

3104. "Electrically heated overlays, mattresses, pads, blankets and the like." Thermalux Electrical Products, Ltd., and A. Sykes. March 7th, 1941. (545232.)

3320. "Electric suction cleaner." H. Herzog. March 20th, 1940. (545233.)

4407. "Electrical measuring instruments." General Motors Corporation. April 3rd, 1940. (545170.)

4791. "High-voltage overhead power transmission lines." Akt.-Ges. Brown, Boveri & Cie. February 10th, 1940. (545276.)

5231. "Electron beam discharge devices." British Thomson-Houston Co., Ltd. April 27th, 1940. (545213.)

6303. "Dry-shaving apparatus." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). May 15th, 1941. (545238.)

6947. "Method of heat-treating the insulation of electric conductors." Okonite Co. May 31st, 1940. (545173.)

7885. "High-voltage overhead power transmission." Akt.-Ges. Brown, Boveri & Cie. July 1st, 1940. (Addition to 545276.) (545281.)

8811. "Photo-electric indicating devices." British Thomson-Houston Co., Ltd. July 13th, 1940. (545140.)

9437. "Apparatus for loading sheath wire electric heating units." British Thomson-Houston Co., Ltd. July 25th, 1940. (545176.)

10985. "Electric control switch mechanism, particularly for refrigerators." Igranic Electric Co., Ltd. August 31st, 1940. (545177.)

11244. "Spring drive mechanisms." British Thomson-Houston Co., Ltd. September 5th, 1940. (545141.)

13017. "Switches, more particularly of the controller drum type." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). October 8th, 1941. (545241.)

14043. "Magnetic slip couplings." English Electric Co., Ltd., and H. S. Carnegie. April 28th, 1941. (Divided out of 542321.) (545145.)

15295. "Apparatus for generation of high-frequency electric oscillations." Board of Trustees of Leland Stanford Junior University. April 20th, 1939. (Divided out of 5120/40.) (545146.)

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia. — QUEENSLAND. — August 20th. Townsville. 3,000-kW turbo-alternator (Specification 119). A. Robertson, town clerk, Townsville.

Belfast.—June 17th. Electricity Committee. Mercury arc rectifier equipment (Specification No. G.2) and carbon dioxide fire extinguishing equipment for substations (Specification No. G.3). Specifications, etc., from the city electrical engineer and general manager, East Bridge Street, Belfast.

Chester-le-Street.—Rural Council. Installation of electric lighting in thirteen public shelters. Plans by A. T. Pallister, surveyor, Council Offices, Chester-le-Street.

Staffordshire.—County Council. Provision and installation of electric motors and drives for stone crushing and screening plant at Hemmingslow Quarry. Applications for forms of tender by June 17th to the clerk of the County Council, Stafford (June 5th).

South Africa.—SALISBURY.—July 2nd. City Council. Electrical metering equipment. (Contract E.19.)

August 26th. Electricity Supply Commission. Plant at Umniati River generating station. (Contract 31/1942.)

Wolverhampton.—July 1st. West Midlands Joint Electricity Authority. 11,000-V overhead transmission line and 11,000-V underground cables. (June 5th.)

Orders Placed

Darlington.—Corporation. Accepted. Grab crane for the electricity works (£1,433).—Priestman Bros.

Friern Barnet.—Emergency Committee. Electrical work at restaurant (£61).—Northmet Power Co.

Huddersfield. — Corporation. Accepted. Transformers to be installed in A.R.P. shelters. —Metropolitan-Vickers.

London.—ST. MARYLEBONE.—Electricity Committee. Recommended. Replacement parts for induced draught fans (£568).—Alldays & Onions.

SOUTHWARK. — Electricity Committee. Accepted. Cables for twelve months. — Scottish Cables.

Manchester. — Electricity Committee. Accepted. Electric kettles.—Premier Electric Heaters. Electricity meters.—Ferranti; Metropolitan-Vickers Electrical Co. AC motors.—Laurence, Scott & Electromotors; British Thomson-Houston Co.; Electric Construction Co. Fire-extinguishing equipment.—Mather & Platt.

Northumberland. — County Council. Accepted. Electrical canteen equipment at the Bedlington Guide Post Senior School (£248).—North-Eastern Electric Supply Co.

Sheffield.—Transport Committee. Accepted. Lamps.—J. Riley & Sons. Lamps and cable.—R. Neill & Co. (Sheffield). Armature coils, commutators and copper rings.—P. R. Jackson & Co. Copper tips.—H. Peace.

Smethwick.—Emergency Committee. Accepted. Restaurant electrical equipment.—Upper Grove Street (£136).—T. Glover; Regent Street (£187).—S.W. & S. Electric Power Co.

Southport.—Electricity Committee. Accepted. Economiser parts (£1,374).—E. Green & Sons.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Banbury.—Restaurant; borough surveyor, Municipal Buildings.

Baxenden.—Hospital buildings in Wooley Lane; secretary, Accrington and District Joint Hospital Board, Accrington.

Beckenham.—Erection of dormitory, alterations to existing building, and erection of works department office at West Wickham; J. Dove, borough surveyor, Town Hall.

Berkshire.—Cooking depots; county surveyor.

Bolton.—Welfare building, Bradford Street; Edward Bros. (Tippers), Ltd.

Canteen, Swan Lane Mills; Swan Lane Spinning Co., Ltd.

Canteen, etc., Lostock Mills; Wm. Heaton & Sons, Ltd.

Clay Cross.—Canteen, Bond's Main Colliery; W. Marsh, manager, Clay Cross Colliery Co., Ltd.

Colwyn Bay.—Decontamination centre; W. R. Salisbury, builder, Church Crescent, Llandudno.

Croydon.—Reconstruction of a ward block at hospital; G. Crump, architect, 43, George Street.

Edinburgh.—Wartime nursery (£4,000); architect, Ministry of Works and Buildings.

Fifeshire.—Police station, Cowdenbeath (£5,500); chief constable, Cupar, Fife.

Gateshead-on-Tyne. — Factory extensions; P. L. Browne, Son & Harding, Pearl Buildings, Newcastle-on-Tyne.

Higham Ferrers.—Municipal buildings; Prof. A. E. Richardson, 41, Russell Square, Bloomsbury, London, W.C.1.

Houghton-le-Spring.—A.R.P. centre; G. M. Pearson, Houghton Road, Hetton-le-Hole, co. Durham.

Huyton.—Proposed development of land as milk distributing centre; Hansons Dairies, Ltd., Edge Lane, Liverpool.

Leicestershire.—Police houses at Thringstone, Ratby and Barrow-on-Soar (£2,244); county architect, Leicester.

Leigh.—Canteens; Combined Egyptian Mills, Ltd.

British Restaurant, Back Salford; T. A. Clare, borough surveyor, Town Hall.

London. — BATTERSEA. — A.R.P. works (£2,700); borough engineer.

LEWISHAM.—Nursery, Shroffold Road (£2,260); Powell, Driver & Foster.

ST. MARYLEBONE.—Shelters (£6,800); Kirk & Kirk, Ltd.

Manchester.—Three British Restaurants at Moss Side, Gorton and Openshaw; G. Noel Hill, city architect, Town Hall, Albert Square, Manchester, 2.

Middlesex.—School huts (£2,140), Feltham; county architect.

Newcastle-on-Tyne.—Further school shelters; education architect, Northumberland Road.

Newcastle-under-Lyme. — Adaptation of premises, Sidmouth Avenue, for School of Art; A. Cotton, borough surveyor, Municipal Buildings.

Pegswood.—Miners' canteen; J. Wilson, 25, Oldgate, Morpeth, Northumberland.

Rotherham.—Bakery extensions, Hope Street; William Jackson & Sons, Ltd., wholesale bakers, Brough, Hull.

Adaptation of premises for central British Restaurant; V. Turner, borough surveyor, Town Hall.

Three colliery canteens; Newton, Chambers & Co., Ltd., Izal Works, Thorncliffe.

Runcorn.—Three British Restaurants at Stockton Heath, Helsby and Frodsham, for R.D.C.; A. J. King, surveyor, Council Offices, Castle Park, Frodsham, *via* Warrington.

Smethwick.—Canteen; Incandescent Heat Co., Ltd.

Stanley (Co. Durham).—Bus station; U.D.C. surveyor.

Staveley.—Houses; J. B. McGaw, surveyor, Council Offices, Staveley, near Chesterfield.

Street.—British Restaurant at Crispin Hall; surveyor, Council Offices, Street, Somerset.

Sunderland.—Alterations and improvements to offices, Hendon Ropery Works; T. D. Gibbons & Son, 15, Hendon Burn Avenue.

Boiler house, Mayfair Confectionery Co.'s Works; William Hammer & Sons, Bury.

Upminster.—Erection of British Restaurant; U.D.C. surveyor, Council Offices, Billet Lane, Hornchurch.

Wardley (Sussex).—Proposed new elementary school; county architect, County Hall, Chichester.

West Boldon.—British Restaurant; N. Hindmarch, surveyor, U.D.C. offices, East Boldon, co. Durham.

Radio Engineers

Institution's Annual Meeting

THE annual meeting of the British Institution of Radio Engineers held in London on May 29th showed that papers had been read regularly during the year in London and at the Midlands and South-Western section meetings. Some 200 new members had been elected from nearly 280 applications considered. Many of the retiring members of the Council were re-elected. Representations continued to be made concerning the necessity for special training facilities within the profession as well as for co-operation with educational authorities. Further developments would largely depend upon the findings of the Professional Purposes Committee, which was concerned with the status of radio and electronic engineers. At the conclusion of the business meeting Mr. O. S. Puckle introduced the subject of "Time Bases," which was discussed informally.

Forthcoming Events

Institution of Electrical Engineers.—*Devon & Cornwall Sub-Centre.*—Thursday, June 25th. 5.30 p.m. (tea, 5 p.m.), Callard's Café, 42, Fleet Street, Torquay. Paper: "Electrical Industrial Installations," by Mr. L. C. Grant.

Incorporated Municipal Electrical Association.—Thursday, June 18th, 10.30 a.m. Grosvenor House, Park Lane, London, W.1. Annual general meeting.

Fuel Luncheon Club.—Monday, June 15th, 12.40 for 1.10 p.m. Connaught Rooms, London, W.C.2. Luncheon and address by Mr. E. Shinwell, M.P. Applications for tickets (7s. each), should be made to the Secretary at 30, Bramham Gardens, S.W.5.

Anglo-Soviet Public Relations Association.—Wednesday, June 17th, 5.30 p.m. Royal Institution, Albemarle Street, W.1. Lecture: "Engineering in the Soviet Union," by Dr. A. P. M. Fleming (tickets 2s. each).

Association of Mining Electrical and Mechanical Engineers.—Friday and Saturday, June 26th and 27th. Grand Hotel, Manchester (not at Preston as originally announced). Annual meeting.